THE IRON TRADE REVIEW

VOLUME XXVII. CLEVELAND, O. NOVEMBER 29, 1894. CHICAGO, ILL. NUMBER 48

MAGNOLIA METAL

IN USE BY

Eight Leading Governments.

BEST ANTI-FRICTION METAL FOR

High Speed Engine, Dynamo, Rolling-Mill, Steamship, Railroad, Saw-Mill, Cotton-Mill, Paper-Mill, Woolen-Mill Silk-Mill, Jute-Mill, Rubber-Mill, Sugar-Mill, Flour-Mill, and all Machinery Bearings.

MAGNOLIA METAL CO.,

Owners and Sole Manufacturers,

London Office, 75 Queen Victoria St.
Chicago Office, Traders Building.

74 Cortlandt Street, NEW YORK.

A Milling Machine or . . . .

a Cutter and Tool Grinder.

If you need either, and where is the shop that doesn't? write

The Cincinnati Milling Machine Co.,

Cincinnati, Ohio.

J. STOCKLY CARY,
CHEMIST,
1760 Monadnock Building, CHICAGO.

ANALYSES OF ORES, MINERALS, IRON, STEEL AND OTHER METALS,
ALSO OF
WATERS, OILS, COAL, AND FOUNDRY SUPPLIES.
GOLD AND SILVER ASSAYING.

GERMAN ASBESTOS

ED. WERTHEIM.

German Asbestos Packing, Paper, Cloth, Etc.
German Asbestos Pipe and Boiler Coverings.
German Carbons for Electric Lights, Steam Pumps and Specialties.

ENGINEER AND GENERAL MILL SUPPLIES.

207-209 Lake Street, CHICAGO.

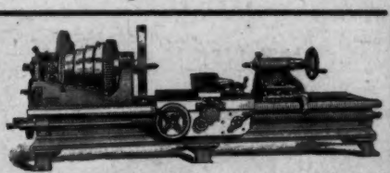
WALSTON—**COKE**—CONNELLSVILLE.

F. J. & H. R. POOL, Western Reserve Building, CLEVELAND, OHIO.

HILL, CLARKE & CO.

MACHINERY.

14 South Canal St., CHICAGO.



GAS, GASOLINE OR NATURAL GAS ENGINES

Simple in construction, economical, close regulation, smooth running.
Adapted for ELECTRIC LIGHTING.

NEWELL BROTHERS, Cleveland O.

Forster, Hawes & Co.,

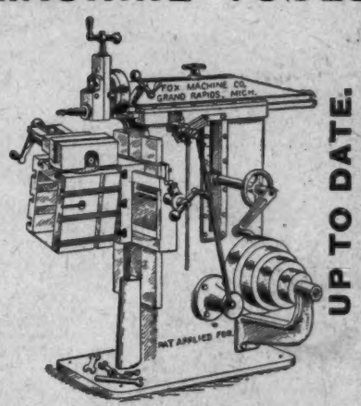
PIG IRON AND COKE,
636-638 The Rookery, Chicago.

AGENTS FOR
IROQUOIS, STERLING SCOTCH, PEERLESS, MALLEABLE BESSEMER, SOUTHERN COKE, NORTHERN and SOUTHERN CHARCOAL IRON,
Foundry Coke.

GREY IRON CASTINGS,

Light and Medium weight,
FINE QUALITY.
The Taylor & Boggis Foundry Co.,
CLEVELAND O.

MACHINE TOOLS



UP TO DATE.

15" Crank Shaper.

Prices and circulars gladly furnished.

FOX MACHINE CO., Grand Rapids, Mich.
313 North Front St.

BUFFALO VENTILATING FANS

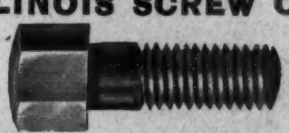
ELECTRIC, STEAM AND PULLEY TYPES. GREATEST AIR VOLUME, LEAST POWER

BUFFALO FORGE CO. BUFFALO, N.Y. U.S.A.

TURNBUCKLES.

Cleveland City Forge & Iron Co.,
CLEVELAND, O.

ILLINOIS SCREW CO.,



50-52 S. Canal st., Chicago.

SHARON FIRE BRICK WORKS,

SHARON, PA.

SILICA

No. 1.

No. 1 Silica Brick. No. 1 Mill Brick.

SILICA BRICK, FOR ROLLING MILLS AND STEEL SMELTING FURNACES, FIRE CLAY.

SHARON PA.

WILLIAM B. POLLOCK & CO., YOUNGSTOWN, OHIO.

MANUFACTURERS OF

STEAM BOILERS--EVERY TYPE--SHEET AND PLATE WORK,

Penstocks, Ladles, Oil and Water Tanks, Buildings, Cupolas, Blast Furnaces, Tanks, Smelters, Gas Producers, Converters, Receivers, Large Draught Stacks.

Riveted Pipe for Water, Gas, Air or Steam. Plate Construction--All Kinds.

STILWELL'S

PATENT LIME-EXTRACTING

HEATER AND FILTER

COMBINED.

Is the only lime-extracting Heater that will prevent Scale in Steam Boilers, removing all impurities from the water before it enters the boiler.

Thoroughly Tested.

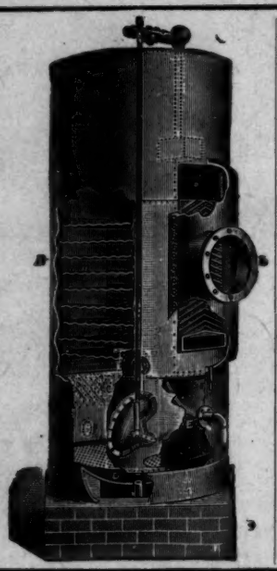
OVER 8,000 OF THEM IN DAILY USE.

ILLUSTRATED CATALOGUES.

Stilwell-Bierce & Smith-Vaile Company,

DAYTON, OHIO.

CHICAGO OFFICE, 63 S. Canal St.



Geo. H. Anderson & Co.,

524 Standard Bldg., Wood St.

PITTSBURG, PA.

High Grade Fire Brick

GRATE SETTINGS, ETC.

BRANDS:

"Anchor," Extra. "Garfield," No. 1. "I X L" Sand

Locomotive Tile a Specialty.

Works and Mines at Bolivar, Pa.

FOR SALE CHEAP.

100 Tons 30 lb. Steel Rails and Splices.
50 " 35 " " " " "
75 " 40 " " " " "
180 " 52 " " " " "
200 " 60 " " " " "

We are in the market at all times to buy equipment and scrap.

GEO. H. SIBELL & CO., Chicago, Ill.

ABSOLUTELY K. & M. FIRE-PROOF.

MAGNESIA

SECTIONAL STEAM PIPE AND BOILER COVERINGS.

SELLING AGENTS.

Boston, S. C. Nightingale & Childs, 134 Pearl st.
New York, Herbert A. Keasbey, 54 Warren st.
Philadelphia, Macan & Co., 1420 Callowhill st.
Baltimore, Wallace & Bro., 432 E. Pratt st.
Washington, Wm. B. Morgan, Builders' Ex.
New Orleans, Delbert Eng'r'ng Co., 23 Union st.
Memphis, Symmes & Co., 162 Front st.
Chicago, Walch & Wyeth, 208 Lake st.
Milwaukee, F. Sprinkman, 133 Sycamore st.
St. Louis, F. Bocler, 108 Walnut st.

THE GREAT COAL SAVER

MANUFACTURED BY THE

KEASBEY & MATTISON CO.,

CINCINNATI, AMBLER, CLEVELAND,

114 W. Second St. PA. 117 Water Street.

SELLING AGENTS.

Detroit, S. P. Conkling, 20 Atwater st., East.
Omaha, Spencer Otis, 310 S. Sixteenth st.
Kansas City, J. H. Stoner & Co.
Des Moines, J. C. & R. B. Carter.
Minneapolis, Arthur L. Otto, Boston Block.
Denver, C. W. Badgley & Co., 18th and Market.
Salt Lake City, Utah & Montana Mach'y Co.
Butte City, Mont., R. W. James.
S. F'ncisco, DeSolla & Deussing, 2 Calif'nia st.
Montreal, Sclater Asbestos Mfg. Co.

THE "LAMBERT" GAS AND GASOLINE ENGINE.

Use gasoline direct from the tank. No boiler, no fire, no engineer. Cheapest power on earth. Made in all sizes from one to 50 horse power. Write for description and prices.

THE BUCKEYE MFG. CO.,

P. O. box A. Union City, Ind.

C. K. PITTMAN,

SHIPPER OF

Coal & Coke

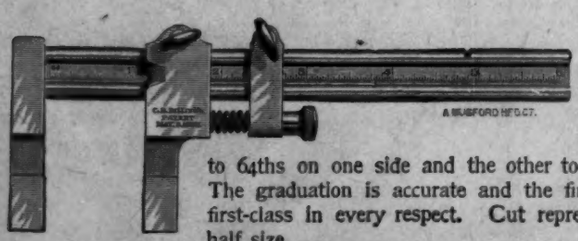
Best Grades of Coke a Specialty.

975 Old Colony Building, Chicago.

THE BILLINGS & SPENCER COMPANY,

HARTFORD, CONN., U. S. A.

BILLINGS' PATENT BEAM CALIPER.



The construction of the Caliper is such that it protects the scale from wear and abrasion. The scale is divided to 64ths on one side and the other to 100ths of an inch. The graduation is accurate and the finish of the tool is first-class in every respect. Cut represents Caliper one-half size.

H. L. HOLLIS. F. A. EMMERTON.

HOLLIS & EMMERTON

ANALYTICAL CHEMISTS.

Mining and Metallurgical Engineers.

ADVICE GIVEN ON FOUNDRY MIXTURES.

Analyses of Ores, Slags, Metals, Fuels, FOUNDRY SUPPLIES, ETC.

1333 The Rookery, CHICAGO. 804 Perry-Payne Bldg. CLEVELAND.

DICKMAN & MACKENZIE,

CLEVELAND, 71 Atwater Bldg. CHICAGO, 1224 Rookery Bldg.

Mining properties examined. Ores sampled at mines, furnaces and all lake ports.

General analyses of Ores, Slags, Metals, Fuel, Foundry Materials and Products, etc.

CHEMISTS AND ENGINEERS.

THE IRON TRADE REVIEW

VOLUME XXVII. CLEVELAND, O. NOVEMBER 29, 1894. CHICAGO, ILL. NUMBER 48.

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

One element of uncertainty in the figuring for '95, in iron and steel, is eliminated by the continuance of the steel rail agreement. There have been intimations that the arrangement by which steel rail tonnage is distributed among the six great plants was in danger and that a scramble for business would follow its disruption, with prices cut as in every other department of the market. It appears that such an outcome was not seriously feared by the members of the association and that the amount of the reduction below the $24 at mill that has ruled the past year was the chief point of difference. At $22, there promises to be a fair volume of buying by railroads able to float bonds; inquiries from some of them are already in. The action of the steel rail makers will give support to other parts of the market, reinforcing manufacturers in the belief that '95 will give a check to the policy of profitless operation that has prevailed so long. The silence of the coke operators in the Connellsville region about the price of their product after Jan. 1 is getting more oppressive. Less than five weeks remain of this year and yet no furnaceman dependent upon Connellsville coke knows what his fuel will cost him after Jan. 1. The operators themselves evidently do not know, and it would appear that further efforts will yet be made to revive the syndicate arrangement, or that the plan is to let those who thus far have refused to enter into an agreement, load up on low-priced contracts, the larger companies holding off meantime and later moving up the price. There has been an encouraging amount of buying in pig iron, billets and rods in the Chicago market the past week but in Pittsburg, Philadelphia, Cincinnati and other selling centers, little change is noted from the preceding week. The general desire to know about the probable status of Bessemer pig early in the year is evidenced in the number of consumers and middlemen who are sounding the market. While there are rumors of transactions, it turns out that there is little buying in the Pittsburg, valley and Wheeling districts. What metal has sold has gone at $10.50@$10.65 and the buyer for December delivery may have been able to shade the lower figure slightly. But present wants are a small factor in the account. Billets have sold on a basis equivalent to $15.25 Pittsburg, but the leading producers, here are refusing to take contracts below $16. Short sellers are still active in fixing the present market. A Youngstown consumer has been able to buy at $16 delivered, which meant $15.15 to the mill taking the order. In rods a sale in the Central West a short time ago below $22 could not be duplicated were there any demand. Chicago has sold freely of late and a good demand in Pittsburg and Cleveland markets is expected early in the new year. Some Eastern pipe orders have been placed recently—prices the lowest. Bridge and elevated work about New York will require large deliveries throughout '95. Bars baffle all predictions of improvement. A 1,200-ton skelp iron contract in the West goes untaken because of long deliveries asked.

THE CLEVELAND OUTLOOK.

Ore shipping from upper lake ports has been prolonged beyond what seemed probable at last report and Dec. 1 will see loading still uncompleted at Escanaba. Boats at the head of Lake Superior have been held more than a week in some cases, frozen ore making exceedingly slow work. In the case of certain Mesabi ore brought to the Two Harbors docks, steam was steadily applied to the cars, but without any effect, and the attempt to get the ore into the pockets was abandoned. At Escanaba, with all the force at work night and day it has been impossible to load more than 3,000 tons a day, and while it was the expectation that 200,000 tons would go out from Escanaba in November that total will be cut down considerably. A close estimate puts the total shipment for the season in the neighborhood of 7,400,000 tons. The estimate made some time ago of a season's total of 1,000,000 tons of non-Bessemer is increased to the extent of the non-Bessemer Mesabis that have been brought down, their character not having been determined by analysis until after the cargoes had left the head of the lakes. Further buying of small lots of Bessemer ores is looked for in the near future by a few furnaces not entirely provided for the winter.

Pig Iron. The reports of recent valley transactions in Bessemer pig iron seem to have about as much foundation as the story of the "$370,000,000 American pipe contract from Japan," of which the daily papers have been telling. There has been a good deal of shopping around by representatives of merchant firms, but only to feel the furnaceman's pulse. A good deal of iron is likely to be piled up in the Valleys by Jan. 1, but thus far there is no willingness to accept offers of $9.75 and $9.85 at furnace even on iron made with 90c. coke. There has been some negotiation for iron for a small Southern Ohio steel plant, but the tonnage is not large. Some intimation from coke producers as to January prices is looked for within the next ten days, and predictions of $1 coke and of a higher combination price are mingled in equal measure. The foundry iron trade has shown more life and a number of foundrymen have been in this market to cover requirements well into 1895. No. 2 iron has been sold at low prices and Southern No. 2 on a basis of $6.75 at Alabama furnace has been met by several Northern sellers. Increased demand does not seem to help this end of the market.

Finished Material. A number of Northern Ohio agricultural buyers and boiler makers, whose wants wil include a considerable tonnage of iron and steel bars and plates, have asked bids on material. Recent sales have shown some keen competition on universal plates, and one or two mills have been persistent makers of prices below 1.15c.; the range has been all the way from 1.10c. to 1.25c., the latter price being still maintained by one prominent seller. An Eastern mill has been making some low quotations on boiler plates in this territory of late, and has taken some business. On beams and channels 1.25c. at Pittsburg mill is the minimum of one large producer, corresponding to 1.34c. Cleveland. The bar mills have kept up the struggle for absolute bottom. Quotations are 90c.@95c., the price depending on specifications, time of delivery and other considerations.

THE CHICAGO OUTLOOK.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

The market is still in a hopeful condition, and in some circles the cheerfulness is considerably more pronounced than it was last week. Except in billets and rods, of which large sales have been made, no increase in either the size or number of orders is reported, but there is a considerably better inquiry, principally for delivery after the first of the year. The rail market is still quiet, and so far no sales have been made for delivery next year. Pig iron, particularly the local product, is in good demand, and good sales have been made in the past week.

PIG IRON.—The situation is changed very little from last week, and the cheerful tone prevailing among sellers of local iron is becoming more and more pronounced, every day. Local iron appears to be getting by far the lion's share of orders going, sales of large lots being reported as closed last week, among them one of 2,000 tons, two of 1,000 tons and several of 500 and less, together with a considerable carload trade. Prices are unchanged, but one of the prominent furnacemen of this territory expresses the belief that prices will be quite a little higher within a short time. Apparently buyers are beginning to partake of the same belief, judging from the amount of buying going on and the number of inquiries still open. Deliveries are being pushed in a good many cases, and frequently are made in excess of the amounts contracted for, which is a healthy sign. In Southern iron a rather quieter feeling prevails, only small sales being reported. There is a fair inquiry, and deliveries are being ordered in good shape, and this taken with the fact that furnaces are no longer cutting prices to any extent, makes the outlook more hopeful. Lake Superior charcoal is doing rather better than has been the case for some time past, and several good sized inquiries have been received. Sales, however, are still small. Our quotations are continued, as follows:

Lake Sup. Charcoal	$13 00@14 50	Southern No. 2 Soft	10 00@10 25
Local Coke Fdy. No. 1	10 25@10 50	South'n Silveries No. 1	$11 50@11 75
Local Coke Fdy. No. 2	9 75@10 00	South'n Silveries No. 2	11 25@11 50
Local Coke Fdy. No. 3	9 40@ 9165	Jackson Co. Silveries	15 00@16 00
Local Scotch Fdy. No. 1	10 25@10 50	Ohio Silveries No. 1	14 00@14 50
Local Scotch Fdy. No. 2	9 75@10 00	Ohio Silveries No. 2	13 00@13 50
Local Scotch Fdy. No. 3	9 40@ 9 65	Ohio Strong Softeners	13 00@13 50
South'n Coke No. 1	11 00@11 25	Alabama Car Wheel	17 50@18 00
South'n Coke No. 2	10 25@10 50	Malleable Bessemer	10 50@11 25
South'n Coke No. 3	10 00@10 25	Coke Bessemer	11 25@11 50
Southern No. 1 Soft	10 25@10 50		

BARS.—The market has been rather quieter in the past week, and sales have been limited in amounts. The inquiry for future delivery continues good, however, and prices are inclined to be a little stiffer, although no actual advance has been made in quotations. There is an inquiry in the market for 1,200 tons of skelp iron but so far no mill has been discovered willing to handle it, as deliveries are asked for running through the whole of next year. Common iron is quoted at 1.05c., guaranteed at 1.15c. and steel bars at 1.25c. f. o. b., Chicago.

RAILS AND TRACK SUPPLIES.—While a goodly number of inquiries are continually being received, they do not develop into orders as yet, although it is expected some of them will, shortly after the first of the year. Prices are unchanged, as follows: Rails, $25 to $27; splice bars, 1.25c to 1.30c; track bolts, 2c. to 2.10c; spikes, 1.75c. to 1.80c.

STRUCTURAL MATERIAL.—There is no change in the situation, and except in orders for bridge material, which is in fair demand, no business of any consequence has been done. Quotations are still made as follows: Beams, 1.45c; angles, 1.40c; plates, 1.45c; tees, 1.65c. Small lots from stock sell for ¼c to ½c more.

BILLETS AND RODS.—Sales of billets on Monday of this week exceeded 10,000 tons, and there is still a very large demand unsatisfied. Delivery on sales made extends through the first three months of next year. An inquiry for 6,000 tons a month for April, May and June was turned down by the local mill, as they are not anxious to sell so far ahead at present prices. The mill now has sufficient orders on hand to run full during the first three months of next year. The rod situation is equally gratifying, as sales have been made which will ensure the running of the Joliet mill through the first three months of next year. Prices are still made at $17 for billets and $23.50 for rods, although it is expected these may advance shortly.

PLATES.—The market has been quiet, with only fair sales, while the inquiry remains good for future delivery. Prices are made: Tank steel, 1.40c to 1.50c; flange steel, 1.65c to 1.70c; firebox steel, 1.75c to 5c; boiler tubes, 75 per cent. discount.

MERCHANT STEEL.—All grades are in fair demand both from mill and store, and quite good sales have been made. Quotations are firm and unchanged. Open hearth spring, tire and machinery steel 1.75c to 1.80c; smooth finished machinery and tire, 1.50c. to 1.60c.; Bessemer bars 1.40c. to 1.45c.; tool steel, 5.50c to 7.50c.; specials, 11c. and upwards.

SHEETS.—Black sheets are in fairly good demand, but have fallen off from last week. Sales have been only fair. Prices are maintained on a basis of 2.40c for No. 27 common iron; 2.45c to 2.50c for sheet steel. Galvinized sheets are quiet and in small demand, and are quoted at 75 and 10 and 5 to 75 aud 15 per cent discount on mill shipments.

OLD RAILS AND WHEELS.—Old wheels are in a little demand at $9.50. Old iron rails are quiet at $10.75 to $11.25; old steel rails are a little lower at $7 to $7.50 for short and $8.75 to $9 for long lengths.

SCRAP.—A few fairly large sales of mill scrap were made last week, but aside from this there was little done. Prices are as follows: No. 1 forge, $8 to $8.50; No. 1 mill, $7; No. 1 machinery, $7.25; axles, $13; cast borings, $3.50; wrought turnings, $5.50; axle turnings, $6.25; mixed steel, $6; heavy cast, $7.50 to $8; stove plates, $5.75 to $6; heavy melting steel, $7.25 to $7.50.

IN OTHER MARKETS.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Pittsburg. Practically all that can be said of the local market is that it has been brought a week nearer the date that is expected to mark the beginning of larger buying. Pig iron sales are of small volume. Bessemer continues weak and $10.40 to $10.65 is the range of prices on current buying; there are few sellers, however, who care to have much to do with the market on such a basis. The fact that some of the large consumers of Bessemer have delayed deliveries on some of the metal coming to them on contracts carries over into the new year a portion of the low-priced iron negotiated for last spring; but the inquiries already out for Bessemer pig for next year indicate that in other directions the demand will be well sustained. There is understood to be considerable piling of iron in the valleys, the furnaces refusing to take prices now offered because of their confidence that the Youngstown steel plant will make a large inroad in the accumulation early in the year. Forge iron is somewhat more scarce, but is still sold at less than $9 valley furnace. Foundry iron is unchanged at $11.50 @ $11.65 for No. 1 and $10.50 @ $10.75

for No. 2. The billet market shows considerable variation in prices. The leading producers are holding to $16, but there is no difficulty in getting steel at $15.50 and from river mills December billets have been sold on a basis equivalent to $15.25 Pittsburg. These transactions do not involve any large tonnage. There is an increase over last week in the amount of mill capacity engaged and a moderate present demand for all classes of finished material. The rail situation is no longer in doubt. The decision of the mills to hold to the agreement for another year is generally satisfactory to the finished material trade, as it averts threatened demoralization. The reduction of $2 a ton is a concession which it is believed will improve the chances of a goodly amount of railroad buying early in the year. Wire rods are weak with little present demand, though there are prospects for a good volume of business in January. The last considerable sale, made in a competing district, brought out a price below $22. Beams and channels are stationary and 1.25c. is the price on ordinary transactions. There is considerable speculation about coke after Jan. 1 and the reserve of the Connellsville operators is thought to foreshadow a combination.

Cincinnati. With the exception of a few customers who are testing the markets with the intention of covering their probable wants until July 1, 1895, there have not been many important inquiries for pig iron during the past week. All salesmen report about the same story, which is that buyers tell them to call again after the first of the year. Then, if orders for castings are coming in freely, it is probable that contracts will be covered. The noticeable feature is that so many foundries are in immediate need of iron on orders already booked. There is a scarcity of cars, especially in the South, and furnaces can not get enough empties to ship the iron when wanted. This of course indicates that exceedingly small stocks are carried by consumers. In spite of the well filled order books reported by Alabama and Tennessee companies there is lively competition for business and shrewd buyers have been finding weak spots. Just now the supply of Lake Superior ore irons is greater than the demand and it is thought that there may be some accumulations during the next six weeks. After that time every one is looking to see the output of all furnaces now in blast move off easily. Collections are good, comparatively few notes are given and failures are infrequent. Two transactions the past week show that in some quarters quoted prices are being more closely adhered to. One was 1,000 tons of No. 2 foundry at $9.25 and the other 1,000 tons of mottled forge at $8.25.

Philadelphia Offers for large blocks of Bessemer iron, delivery January to May, 1895, have been made at full prices now ruling, but in each instance have been declined. No furnace can tell what next year's coke is going to cost and therefore cannot figure the cost of making pig metal. It is inevitable that coke must advance and that better wages must be paid the miners of coal and men employed in making coke. Prices on lake ore irons, Bessemer and non-Bessemer are weak for this year's delivery. Two concerns in the Pittsburg district who have bought on the average 1,500 tons of Bessemer daily now make about all that they need. That cuts quite a figure at present in the market.

Buffalo. Interviews with the foundry trade bring to light a tone of confidence and a general report of slowly improving business. The demand for pig iron is of a healthy nature which keeps pace with the natural supply for this region. Were it heavier, more distant sources would have to be called upon. There is some dispositon to cover requirements for all of 1895, but sellers are reluctant to consider such trades and so not much is accomplished. An unexpected scarcity in the popular brands of Lake Superior charcoal iron has developed during the week, and one prominent company has withdrawn absolutely from the market until the opening of navigation next spring.

LAKE SUPERIOR IRON MINES.

The Canton has let a contract for 1,000,000 feet of mine timber to be delivered this winter.

The Oliver Mining Co. has stopped shipping, with a total of about 505,000 tons to its credit—a good record in view of the fact that up to July 1 but one shovel was loading and in September and October the mine worked but half time. H. W. Oliver and H. M. Curry, the latter representing the Carnegie Steel Co.'s interest in the property, inspected the mine recently.

The Chandler will show an output for the season of upwards of 600,000 tons.

At the Minnesota Iron Co.'s property at Soudan, the force has been gradually reduced. Stockpiling has begun.

Thirty to forty men have been put at work at the Ashland mine since the recent election of directors. The management is in the hands of W. J. Olcott. It is expected to increase the force to 125 men as fast as room can be made. The intention is to work the north lens discovered in May, 1893, by crosscutting to No. 6 shaft.

Wednesday night there was hoisted from the Lake Shaft mine of the Cleveland Iron Co., 1,303 tons of ore. This was for one shift. There was some delay caused by a car getting off the track on the motor line that stopped work for a time. We believe this will equal the best work done from a single shaft in a similar time by any mine in this region. The Lake Shaft is finely equipped in the way of a hoisting plant, has an underground haulage system that is a good one, and assists materially in rapid delivering of ore to the shaft. The cars are handled by an electric motor. They will soon put in a new generator possessing three times the power of the one now in use, and which will increase the haulage service considerably.—[Iron Ore, Ishpeming, Mich.

The Escanaba River Land & Iron Co. granted the board of directors power to lease section 18 of the company's lands. The party taking the lease is to pay the $50,000 indebtedness and a royalty of 15 cents per ton on ore mined. The indebtedness is to be repaid by the company with royalty.

A New York dispatch of Nov. 23 says: A deficiency judgment for $452,571 has been filed in the county clerk's office against Alfred and Leonidas Merritt, of Duluth, Minn., in the suit begun over a year ago by the American Steel Barge Co., on notes and for money advanced the Mountain Iron Co., on Duluth, Mesabi & Northern railway and other securities.

The deal between the Rouchleau-Ray Iron Land Co. and the Minnesota Iron Co. has been closed, the former having sold Government lot 3 and the southeast quarter of northwest quarter of section 5, township 57, range 17, for $200,000 cash to the Fayal Iron Co., which is controlled by the Minnesota Iron Co. The standing pine on the property is excepted from the sale.

The option of the Minnesota Iron Co. on the Weimer property near Ely lake has been extended, with a probability that the deal will be made. The lease was sold once to Messrs. Kimberly and Weimer for $120,000, and they paid $20,000 in cash on the deal, besides expending considerable money for explorations.

Work on the old Wheat mine on the Marquette range will be resumed. It is expected that 30,000 tons will be mined the coming winter.

Shipments of Franklin ore have been 223,000 tons for the season. From the entire Mesabi range the total is close to 1,800,000 tons.

The Fayal Iron Co., controlled by the Minnesota Iron Co., has found excellent ore in its test-pitting on the property adjoining the Franklin, and if the ore should run as uniformly of Bessemer quality as the latter the deposit will prove very valuable.

THE IRON TRADE REVIEW

DEVOTED TO
IRON AND STEEL MANUFACTURE, FOUNDRY AND MACHINERY TRADES, IRON ORE PRODUCTION, TRANSPORTATION, AND GENERAL INDUSTRIAL PROGRESS.

PUBLISHED EVERY THURSDAY BY
THE IRON TRADE REVIEW CO.,
CLEVELAND, OHIO.

CLEVELAND:
27 VINCENT STREET.
A. I. FINDLEY, Editor.

CHICAGO:
1141 MONADNOCK BLOCK.
B. M. GARDNER, Associate Editor and Western Manager.

TERMS OF SUBSCRIPTION, (strictly in advance):

One year	$3 00
Six months	1 50
Three months	75

Advertising Rates Furnished on Application.

The Cleveland News Co. will supply the trade with THE IRON TRADE REVIEW, through the regular channels of the American News Co.

ENTERED AT THE POST OFFICE IN CLEVELAND, O., AS SECOND CLASS MATTER.

NOVEMBER 29, 1894.

OFFICIAL confirmation comes to *The Iron Trade Review* of the report that at the meeting of the Steel Rail Association the past week, it was agreed to maintain the organization as it has existed heretofore, and to reduce the price of rails from $24 to $22 per ton at Eastern mill. All rails weighing above 45 pounds to the yard are to be considered standard sections; heretofore 50 pounds has been the minimum. Steel girder rails will be sold at $24 at mill. It is believed, from what is known of the proceedings of the recent meeting of rail mill representatives, that the steel manufacturers of the country are determined that one interest, at least, shall not participate in the general sacrifice that has been made of iron and steel manufacture the past year. This spirit ought to be contagious to some extent, at least. Somewhere, sometime, somehow, a stop must be put to the ruinous cutting that has come to be well-nigh universal. Signs are increasing, that when the statements are made up at the first of the year, a new leaf will be turned with '95, and business conducted with a view to winning a profit. That is a platform on which representatives of the iron and steel trades ought to stand together.

THE last meeting of the Western Foundrymen's Association was noteworthy, not only for the attendance of a goodly number of practical foundrymen but for the interest taken in the investigation of the Association's committee on methods of making test bars. It would appear from the discussion, that the round bar cast on end is not without friends, in spite of the untoward results attained by the tests thus far conducted. We are informed that later experiments made with the better method which Mr. West brought to the attention of last week's meeting have been attended with satisfactory results, bars being secured quite free from the sand flaws that were so serious a drawback in the tests reported upon. The decision of the Association to continue the investigation gives promise of further data which will be looked for with interest. The wider the circle of investigators, the better the chance for correct deductions, and the correction of errors due to local causes. Mr. West has encountered a pretty strong current of criticism in the methods of testing he has recently proposed. This has already modify his procedure somewhat; but his main contention that the round bar cast on end is more reliable than the square bar cast flat, he still maintains. The papers to be read before the American Society of Mechanical Engineers next month on this subject will bring together results attained by the use of both forms of bar; and it may be expected that they will go a long way toward establishing a method which the foundry world can unite upon. Uniformity in method is a great desideratum, if any progress is to be made in comparing the work of various investigators. The personal element in this matter ought to count for little. What the foundry world is entitled to is the most accurate and the most scientific method and the one freest from liability to variation from local and individual causes.

FIVE months after the end of the fiscal year, with the deliberation that has marked all the official reports on this industry in the past 18 months, we have the Treasury Department's statement as to the production of tin plate in the United States for the quarter and for the year ending June 30, 1894. In that quarter 46,466,335 pounds of tin and terne plates proper was produced by 40 firms, against 38,260,411 pounds by 36 firms in the quarter preceding. Of the above output, 33,501,344 pounds, or 72 per cent., was made from sheets rolled in the United States; to which amount is to be added 1,807,854 pounds of American sheet iron and steel made into wares tinned or terne plated. The increased use of American black plates in the past three years is shown in the following table, which indicates that double the amount of home-rolled black plates was employed in tin plate manufacture in the last fiscal year, that was used in the year preceding:

Period of manufacture.	American black plate lbs. total.	Per cent. Am'c'n Av. per quart'r	Foreign black plate, lbs. total.	Per cent. foreign Av. per quart'r	Total lbs.
Year ending June 30, '92.	9,296,553	68.12	4,350,166	31.88	13,646,719
Year ending June 30, '93.	43,599,724	43.68	56,219,478	56.32	99,819,202
Year ending June 30, '94.	85,968,202	61.74	53,255,265	38.26	139,223,467

The production in the quarter ending June 30, of American black plates of the class weighing lighter than 63 pounds per 100 square feet was 32,449,205 pounds. This is against 23,514,881 pounds in the quarter ending March 31, which was the banner quarter up to that time. The record of the third year of this industry is surprisingly good in all particulars. The quarter ending Sept. 30 is not likely to show as large production, the malign influence of the new tariff law having already begun to show itself. As for the last quarter of the year, now two-thirds gone, there will be little in it to be proud of, the dispute over wages having brought the industry almost to a complete standstill.

A NEW and extraordinary development has come up in the week, in connection with the trouble in the tin plate mills. The Amalgamated Association and its lodge to which the employes of the United States Iron & Tin Plate Mfg. Co. belong have brought suit against that company and against the American Tinned Plate Manufacturers' Association, alleging a wage contract and asking the courts to enforce it. The United States Iron & Tin Plate Mfg. Co. is operating its plant at Demmler, Pa., with non-union men, at wages 25 per cent. below the scale. The Amalgamated Association alleges that this proceeding and the notification the company gave its old men Nov. 3, 1894, of a reduction from the scale, of 30 per cent. for rolling and 25 per cent. for doubling,

heating and shearing on its black plate mill, are in violation of the wage contract made between the company and the Amalgamated Association on July 6 last. It asks that the company be enjoined from operating its plant at the reduced wages. The hearing of the case is set for Dec. 1. Meantime it is intimated that the answer of the company will allege a violation of the agreement by the men:

They will admit the mutual agreement, but will refer to the procedings of the conference to prove the nature of the contract. They will attempt to show that the defendants, in the conference, expressly stated that in case a reduction took place in the tariff on finished tin plate a corresponding reduction in wages must follow, and that they signed the contract only when the plaintiffs, through their committee, agreed to hold another conference, in case of tariff reduction, to consider what lowering of wages was necessary to correspond with the change in tariff. They will admit that a further conference was held, but will contend that the necessary "consideration" agreed upon by the workmen was not given to the subject. They will also allege that they were willing to discuss the matter still further, but that the members of the Amalgamated Association, by vote, peremptorily refused to permit their committee to meet the manufacturers again, in order to arrive at a settlement of the wages. They will claim that the plaintiffs thus broke their contract, and consequently released the defendants from further adherence to its terms.

It was not long ago that the strange spectacle was presented of a Welsh tin plate firm suing and getting judgment against its employes for striking for an advance, after signing a year's contract at a stipulated wage. The unusual suit begun at Pittsburg presents a similar question from the other side, yet there is an important difference. A contract is to be construed in the light of the circumstances attending its signing. The stipulation insisted upon by the manufacturers that there should be another conference in case of tariff reduction implied, if it meant anything, that some reduction in wages was a foregone conclusion, and that the question to be adjusted in friendly conference was as to the amount of the reduction. To agree to a new conference and then to assume at the outset the attitude that no reduction whatever should be made, is certainly going counter to the spirit of the original contract and indicates a desire to win on technicality rather than on the merits of the case. Meantime, Welsh tin plate manufacturers are seeking with good prospects of success, a 25 per cent reduction in the cost of labor, on the heels of the tariff reduction. Their purpose is evidently to force the fighting in this interval of uncertainty in the United States, and by following up the advantages of low tariff and discriminating freights, to check the successful career of the native industry. Thus far they seem to be getting excellent support from the Amalgamated Association, and the news of the latest move at Pittsburg will give them fresh encouragement to persevere.

OUR wide awake contemporary, the *Marine Review*, signalized the launching of the St. Louis and the second annual meeting of the Society of Naval Architects and Marine Engineers with a double number that fully reported both events and gave a magnificent array of engravings—views of the St. Louis and other vessels at the Cramp yards, and portraits of the officers of the naval society. A new heading was an added attraction and an index of appreciative constituents.

THE Cleveland Rolling Mill Co. is sending out an excellent specimen of its hoop steel in the form of a foot rule, polished and graduated on one side and on the other showing the finish of the steel as it comes from the mill. One end is rounded and the edge stamped to indicate the various numbers in the standard United States gauge from 25 to 6. The specialties of the company are indicated on the face of the steel.

PERSONAL.

Mr. W. J. Keep is on the program for the meeting of the A. S. M. E. at New York Dec. 3-7, for a paper on "Relative Tests of Cast Iron." This is in the main Mr. Keep's report as a member of the committee on a standard for test bars, appointed by the society early in the year.

Thos. D. West is announced for a paper at the December meeting of the A. S. M. E. in New York on "Relative and Special Tests of Cast Iron." It will embody the results of recent experiments by the writer.

Joseph D. Weeks, of Pittsburg, made an address before the recent Congress of Conciliation at Chicago on "The Relations of Employer and Employe in Manufacturing Affairs." M. M. Garland, president of the Amalgamated Association, followed with an address on "Sliding Scales and Kindred Methods."

Andrew Carnegie has returned from Pittsburg to New York. He is not expected at Pittsburg again until the dedication next October of the Pittsburg Carnegie Library.

James Cochran, one of the wealthiest men in Fayette county, Pa., died Nov. 25, at his home in Dawson, Pa., aged 72 years. Mr. Cochran was the pioneer coke manufacturer of the Connellsville region. He was the senior member of the Thomas Cochran Coke Co. and was also a principal stockholder in the Juniata Coke Co. and the Washington Coal Co.

President Powell Stackhouse, of the Cambria Iron Co., Johnstown, Pa., and of the Penn Iron Mining Co., has been inspecting the latter company's properties at Norway, Mich., the past week.

Carl Amsler, of the engineering firm of McClure & Amsler, Pittsburg, died at his home Nov. 22. In 1870 he became connected with the Keystone Bridge Works, Pittsburg, and later in turn was connected with the Homestead Steel Works, the Riverside Iron Works' Bessemer steel plant at Wheeling and Mackintosh, Hemphill & Co., of Pittsburg. He superintended the erection of a Bessemer plant at Mingo Junction, O., and of the original plant of the Duquesne Steel Works. In 1889 he entered the firm of McClure & Amsler.

Eckley B. Coxe has resigned the presidency of the Delaware, Susquehanna & Schuylkill Railroad, the Cross Creek Coal Co. and the Coxe Iron Co. Mr. Coxe desires some relief from business cares. The report that he is seriously talked of for the Reading presidency is erroneous.

W. G. Mather, president of the Cleveland Cliffs Iron Co., is spending several weeks at the properties of the company in the upper peninsula of Michigan.

John A. Potter, vice-president and manager of the Cleveland Steel Co., has gone to Pueblo, Col., for a stay of three or four weeks.

AT Cincinnati, the Board of Administration is investigating charges against Supt. Thorp, chief of which is that in the construction of the Prince Hall water tanks he permitted changes that saved Riter & Conley, of Pittsburg, the contractors $10,000. It is charged that T irons were omitted, holes punched instead of drilled, angle irons omitted, number of holes reduced, bolts omitted, thickness of base iron reduced. It is claimed in defense that the tanks as constructed are better than if made according to specifications.

MESSRS. PICKANDS, BROWN & CO., of the Rookery, Chicago, have lately been made sole selling agents for the Spring Lake Lake Superior charcoal iron made by the Spring Lake Iron Co., of Spring Lake, Mich. The furnace is now in operation after having been shut down for some time, during which extensive repairs were made. The furnace is now producing standard charcoal iron, and as the brand is well and favorably known and Messrs. Pickands, Brown & Co. are prepared to fill orders for any grade, it is probable that considerable business will come to them on this iron.

THE Spearman Iron Co. will erect a new blast furnace at Sharpsville, Pa., where the present stack of the company stands. The new furnace will be 75 feet by 10 feet. A hoist will be erected similar to that now in use at the remodeled Alice furnace. A new casting house will also be erected. Work will begin next month and will be completed by July 1. The plans have been made by Julian Kennedy, of Pittsburg.

IMPROVED PYROMETERS IN IRON-WORKING.

In a paper read at a monthly meeting of the Franklin Institute at Philadelphia, a description of a new pyrometer exhibited in use was read by Mr. Edward Brown, who is well known as the pioneer in the pyrometer business in the United States. His original hot-blast and standard portable pyrometers were introduced to the iron trade about the year 1870, and he has since sold at least 2,000 of them, chiefly to the iron trade. American iron and steel manufacturers scarcely know any other pyrometer. The paper contained much historical and descriptive matter of interest to blast furnace, tin plate, and malleable firms and other iron manufacturers. We give a synopsis below:

Mr. Brown's new pyrometer is for use in annealing ovens and heating furnaces under natural draft where the temperature is above red heat. It is simple in construction—an essential feature when used by ordinary workmen; and it needs no elaborate description, no high-priced attendant, or any algebraic formula to work it. It consists of a dial and a stem like an ordinary stationary pyrometer. At the end of the stem is a heavy rectangular frame protected from heat in which is hung a very thin strip of platinum, or it may be a metal of the same material as the frame. This strip is heated to the full temperature of the furnace in 20 seconds (the frame being only just warmed), and its expansion is communicated through a long protected tube to the pointer on the dial. After use the instrument is immediately withdrawn, and as soon as cold (which takes from 15 to 30 minutes) it can be used again.

It may be of interest to the iron and glass trade to describe, briefly, the improvements made in the ordinary stationary pyrometers, because one of the chief reasons why they fail to give satisfaction is the lack of knowledge of how to use them.

It is not the intention in this article to describe the numerous contributions to the science of pyrometry by scientific men, such as the pyrometers of Wedgewood, Daniels in 1830, Sir W. Siemens in 1860, the air pyrometers used by many experimenters, the thermo-electric couple of Le Chatelier, and the optical pyrometer of Le Cornu, by which last two we have the latest and most reliable tables of high temperatures. They have contributed much assistance to what may be called laboratory work or exact science in metallurgy, and have given us a better standard for high temperatures. At the same time these instruments are hardly such as can be put into the hands of an ordinary workman at a furnace, and they have therefore had only a limited sale. Exceptions are made of Siemens' copper ball pyrometer, which is a good standard at present for annealing oven temperature over a red heat. With a little practice considerable accuracy may be obtained by it. It may also surprise many readers to know that we have at present in pyrometers no accurate standard scale above the ordinary thermometer, in the same sense that weighing scales may be made accurate to 5 pounds or 5,000 pounds. One make of pyrometers will indicate 10 or 20 per cent. higher at 1,000 degrees than another make. By this means very flattering results as to high temperatures may be obtained. Every new make has been heralded as solving the problem, only to have, in a few years, its inaccuracies discovered.

For instance, "The Engineers' Pocket Book," 1856, gives the melting point of cast iron by Wedgewood at 17,977 degrees. By Molesworth, in 1864, we have 2,876 degrees, whereas tables of to-day, by the latest concensus of opinion, give it as nearer 2,200 degrees.

The standard of Brown's "hot-blast" pyrometer to 1,200 degrees has remained the same for 25 years, and, though once supposed to be 20 per cent. low, the latest investigations have proved it to be about correct.

Returning again to the construction of stationary pyrometers. The form of the original English "Gauntlett" pyrometer of 1860 is best known for practical use. It consists of a gauge head with a stem of two metals, which vary in their ratio of expansion. This though indicating 1,000 degrees for a short time, was not long accurate over 600 degrees. It is made to-day more durable at 1,200 degrees than it was then at 600 degrees. The chief trouble was that, if adjusted for an insertion of 12 inches, it would register at 24 inches insertion, just twice as much as it should do. Of course such a primitive contrivance brought pyrometers into disrepute, the users affirming that they could make one register any degree desired. We may imagine cases where this feature would be a desideratum. If this pyrometer be inserted in a high temperature suddenly the pointer will rise far too high. This is caused by heating of the outside tube first. As soon as the stem is evenly heated all through, which may take 10 or 15 minutes, the pointer settles to its correct indication.

In 1872, Mr. Brown made his pyrometer non-pyrometric above a certain line, so that, whether inserted 12 inches or 24 inches, its variation would not be over 10 per cent. This year it was still further improved, so that it rarely changes two per cent under varying depths of insertion. This feature is especially valuable to tin plate manufacturers and for the testing of boiler flues where the walls vary in thickness. The best result is still obtained when each pyrometer is made for and adapted to its own particular use. It now approaches nearer to the ordinary thermometer, which is supposed to be correct whether the stem is inserted one inch or six inches. So it appears that the art of indicating high temperatures by the use of the pyrometer has by no means been stationary with the general march of improvement. For the above two inventions letters patent have been granted recently in the United States and in England.

THE QUESTION OF SHOP COST.

TO THE EDITOR OF THE IRON TRADE REVIEW:

I was under the impression that every one connected with a mechanical shop, from the office boy up, had read one or more of the articles published of late years, pertaining to shop cost, and consequently were to an extent familiar with the subject. An incident would indicate to the contrary.

Recently being in the office of a gentleman who has just started in business, a bill was presented, the first items of which appeared to be satisfactory, but the last, which was for a certain number of hours of labor at 50 cents an hour, was questioned, and I was obliged to listen to the conversation regarding it, which was something as follows:

"I think your charge for labor is excessive. The man who did that work was not paid over 25 cents per hour, and to charge me double is an outrage, and I shall not pay it."

The clerk presenting the bill offered no explanation of the item, but asked what would be satisfactory. The reply was: "I will be willing to pay 40 cents per hour and that will give your people a clean profit of 15 cents per hour, which should be enough. When I get my shop in operation I shall be willing to do work at a much lower price, and it will leave me a satisfactory profit."

The fact that this was said with sincerity was what at racted my attention, as the gentleman referred to was a man of good judgment in mechanical matters, but evidently in that of cost he is very much mistaken, and I fear it will eventually be the means of much loss, and possibly of embarrassment to the firm which he represents.

If it ended there, it would not be so harmful, but unfortunately it does not, for the goods made are brought into competition with others, and the cost being figured on a false basis, prices are named to correspond, with results better imagined than described. I wonder how many there are to-day, who, after all that has been written in reference to the matter of cost, entertain the same views as those of the person referred to. Would it not have been better if the clerk had been posted and explained that in addition to the wages paid, there were expenses such as rents, power, supplies, depreciation of the value of tools, superintendence, etc., with results to the benefit of all parties directly or indirectly interested? SEG.

IT is announced that the Wellman iron and steel plant, at Chester, Pa., will be sold on Dec. 15th or during the 30 days following that date, Judge Clayton having so decreed. Attorney G. T. Bispham, of Philadelphia, who represents creditors to the amount of $450,000, was present in court at Media on Nov. 17th when the decree was made, and offered some suggestions looking to the starting up of the plant by a company which is ready to take and operate it. Mr. Bispham said he had about completed an arrangement for putting $170,000 of new money into the plant and paying the unsecured creditors in preferred stock. If the arrangement were completed he would yay $20,000 to secure the interest on the company's bonded debt.

SHOP AND FOUNDRY NOTES.

The relative advantages of malleable iron and cast steel in car couplers were discussed in a paper by A. M. Waitt, at the October meeting of the Western Railway Club. The following paragraph from it will be of special interest to malleable foundrymen: "I am to-day resting again firmly in my faith in the malleable iron coupler as the safest, surest and best. I would not say for a moment, that in a pulling test the best malleable iron would outlast the same section of best steel; but I believe from experience and from observation, that to-day more reliability can be placed on getting a uniform result in quality and strength with malleable iron than can, with the most approved methods, be placed on getting reliability and uniformity in cast steel. There seems, in spite of the latest improved methods, to be a peculiarity in steel castings by which certain elements separate themselves and concentrate at some one point in the metal, leaving other parts lacking in those elements, and thereby rendering such parts weaker than others, and leaving the steel not uniform in density, and varying considerably in percentage of carbon. It is due to such peculiarities in cast steel that some roads, that have made extensive use of steel couplers, have, during the past year, abandoned the steel for malleable iron. Undoubtedly the time will come, before many years, when cast steel will be made with absolute uniformity and free from the blow holes which are so often a prominent feature of the metal used in castings. Until the time arrives, let the manufacturers use every effort to raise the standard in malleable iron to its highest point, feeling, as they can safely do, that with attention to proper mixture and plenty of time in annealing, malleable iron may be depended on to produce a uniform result, almost without exception."

***

The attitude of foundrymen toward charcoal iron is a question that is having close study from makers of that metal. The substitution of coke iron is going on to an extent in malleable and car wheel foundries, but there are certain uses in which charcoal iron will always be in demand, and in the two lines mentioned there are still many foundries that have not departed from their established practice. The use of coke iron is apparent, however, in the cheapening effect upon the charcoal iron market. A Chicago pig iron selling firm remarks in its last market report: "The demand here is entirely for small lots, and the future is so uncertain that some of the largest companies are declining to offer excepting for early delivery. It is a recognized fact that with a return to normal business conditions, there will be in the aggregate quite a demand for this class of metal. The furnaces best located, with the most modern equipment, and the most capable management, are the ones that are going to control the trade which will always exist for this class of iron."

***

The large fly-wheel recently built by the Bass Foundry & Machine Works of Fort Wayne, Ind., for the New Castle, (Pa.) Wire Nail Co., while not the largest driving wheel in the country, as stated in press dispatches, may be the largest of its particular type. It is a rope transmission wheel 25 feet in diameter, grooved for 33 two-inch ropes. It is constructed of three separate wheels bolted side by side on the same shaft, each wheel being cast in halves, making but six castings in the entire wheel. The aggregate weight of these castings in the rough was 120 tons. The engine is one of the largest of its kind in the country, if not the largest, being a 36 and 70x60″ tandem compound Corliss to be run condensing. It is of massive construction and contains many new features.

***

An attempt made in Sweden to produce an extra strong cast iron, in order to reduce the thickness of shrapnel shells, so that the capacity of the chamber within them can be increased, produced a series of castings giving an average tensile strength of 19.5 long tons per square inch, with 0.38 per cent. extension in four inches. The firm which makes the castings guarantees a strength of 17.8 long tons per square inch.

THE Indiana Tin Plate Co. has been superseded by the Atlanta Steel & Tin Plate Co., Atlanta, Ind. They are erecting three mills. The tinning house with eight stacks is already in working order.

THE LIFE OF A BLAST FURNACE MANAGER.

The direction of a blast furnace plant is not a bed of roses it is a position of grave responsibility, and often of considerable personal risk, demanding constant and continuous oversight. While the manager's office hours may ostensibly correspond with the ordinary working day, he is, in reality, never off duty and is as likely to have a night call as many physicians. In the office the manager has to attend to the neccessary correspondence, which will insure obtaining supplies of ore, fuel and flux; ordering them in advance, watching their shipment, so that they may arrive in proper time to avoid unnecessary handling, and to maintain sufficient reserves of stock for emergencies, at the same time preventing such accumulation as would be disadvantageous. Bills for lubricants, tools, supplies, raw materials, freights, and the pay rolls must be examined and audited, and the reports prepared daily, or, in many cases, twice a day, by those having special charge of details, must be analyzed and prepared for a general report. Consultation with assistants concerning various special features, and with the chemist as to the work in his laboratory, are parts of the daily routine, and it is seldom that a day passes but what a furnace manager must give some time to visitors or the ubiquitous drummer. To keep abreast of the times he must read the trade and technical publications, proceedings of engineering societies, etc. In some plants where the manager looks after the sale of the pig iron made his duties are augmented by the attention which a study of the market and correspondence or interviews or visits to his customers demand.

This refers to a blast furnace moving along regularly, but the multiplicity of parts about the plant, the close watchfulness of every detail demanded, to maintain continuous operation, and the widespread influence which some minor irregularity or defect may exert, are constant menaces against blast furnace management being considered a peaceful pursuit. A noted iron metallurgist who lost his life while endeavoring to correct an irregularity in the working of one of the blast furnaces under his control said to the writer while discussing the blast furnace: "My greatest anxiety and my constant effort is to maintain regularity of operation in all parts of the plant, for a slight defect may result in great expense loss of product and physical exhaustion."—[John Birkinbine in Cassier's Magazine for December.

Talk of a New Coke Syndicate.

Speaking of the prospect for a higher price for coke after Jan. 1. the Connellsville *Courier* says: "There is a disposition among the operators of the Connellsville region to have some sort of an agreement by which to regulate the selling price of coke. A majority of them are in favor of such a scheme and it is a fact that steps have been taken during the last three weeks to effect an organization similar to the old coke syndicate. The success of such a combine depends mainly on several individual operators, who have heretofore refused to act with the majority of producers in this region in keeping coke at a profitable figure. The cut-throat policy of the last two years has been ruinous both to the operators and the workingmen. On Feb. 1, 1895, the Frick scale, upon which basis the region is now working and over which the last strike was fought and lost, will expire. A new scale will be drawn up."

The report for the week ending on Saturday, Nov. 17, shows 13,936 active and 3,638 idle ovens, with a total estimated production of 139,207 tons. Compared with the production of the previous week, this was an increase of only 18 tons. In the active list of ovens there was a net gain of 15. The shipments for the week aggregated 7,533 cars, consigned as follows: To Pittsburg and river tipples, 2,401 cars; to points west of Pittsburg, 3,735 cars; to points east of Connellsville, 1,397 cars. Compared with the shipment of the previous week, this was an increase of 134 cars.

J. B. KNIGHT, of Norway, Mich., Commissioner of Mineral Statistics of Michigan, announces that the volume for 1892 and 1893 will very soon be ready, and that it will be soon followed by that for 1894. Mr. Knight has visited personally every mine, quarry and furnace in the State.

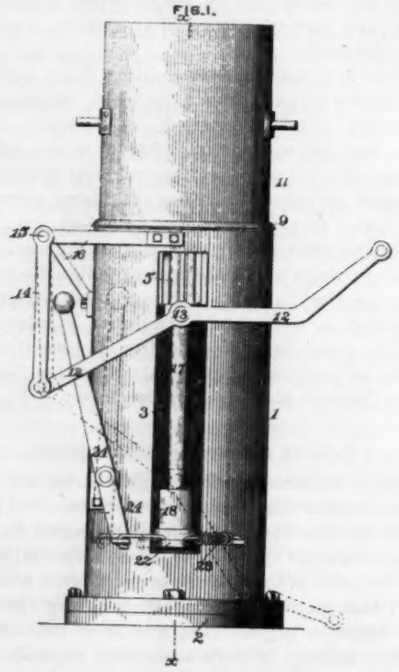
HAND-JARRING MOLDING MACHINE.

Views of a new molding machine, the invention of Charles Herman, of Allegheny, Pa., are given in the accompanying cuts. The aim is the even compacting of the sand about the pattern in the flask and the easy and quick withdrawal of the pattern. Fig. 1 is a side elevation of the machine. Fig. 2 is a sectional elevation, and Figs. 3 and 4 are sectional plan views, the planes of section being indicated by the lines x, x, and y, y, respectively, of Fig. 2.

A cylindrical frame 1 is mounted upon a suitable base plate 2 and is provided with longitudinal slots 3 for the projection of the ends of the cross-head 4, arranged within the cylinder. This cross-head is made of somewhat smaller diameter than the cylinder, as shown in Fig. 3, and upon this is secured an annular frame 5, provided with a series of radial fingers 6, adapted to bear against the inside wall of the cylinder, and serve as a guide for the cross-head in its vertical movements. Upon the annular frame 5, is placed a board to which is secured the pattern 8. A post 17 is secured to the cross-head and extending down through the guide 18 attached to the base plate, is normally supported by the jarring block 20. The jarring block is arranged within a carrier, normally held over an opening 25, through the base plate, and provided with an arm 22, pivotally arranged upon the base plate.

In the molding operation the cross-head is raised by means of levers 12, provided with bearings for the trunnions 13 of the

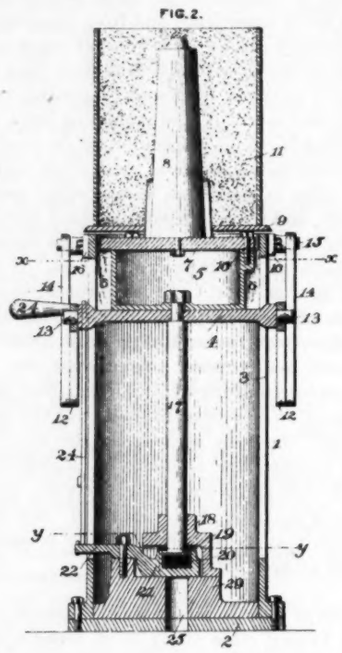
FIG. 1.



cross-head and pivoted to the lower ends of links 14 loosely supported at their upper ends by a shaft 15, mounted in arms 16 attached to the cylindrical frame. In forming a mold, a draw plate 9 provided with openings for the projection of the pattern through it is first slipped over the pattern, and rests upon the heads of a series of bolts 10, securing the pattern board to the frame. Upon the draw plate is placed the flask 11, which is then filled with sand. The molder raises the levers 12 and with them the cross-head and parts carried thereby, including the flask and contained sand, to a sufficient height and then permits the whole to drop, the downward movement being arrested by the jarring block 20.

After the sand has been sufficiently jarred or compacted in the manner described, the operator, by pulling on the lever 24, shifts the carrier 21, therby permitting the rod 17 to pass down through the opening 25. During this downward movement of the cross-head, pattern plate and pattern, the draw plate 9 will rest upon the upper end of the cylindrical frame, thereby stopping the downward movement of the flask, and permitting the withdrawal of the pattern by the continued downward movement of the cross-head and pattern 8. The openings between the fingers of the annular guide frame permit the sand to fall to the bottom of the cylindrical frame, thus avoiding all clogging. When it is desired to remove the flask from the machine before drawing the pattern, a non-adjustable jarring block may be attached to or formed integral with the base plate. As in forming molds, the sand is compacted firmly around the pattern and considerable force is required to withdraw the pattern, when a steady pull is employed. The stripping plate is movable above the end of the guide frame, which serves as a stop for the stripping plate during the drawing of the pattern, so that in drawing a pattern the pattern board, pattern, stripping plate and flask

FIG. 2.



are raised by the lever 12 until the stripping plate is a short distance above the guide frame or stop, and the several parts are allowed to drop. As they drop the stripping plate and flask are stopped with a jar, thereby loosening the pattern in the sand, so that it will readily separate from the mold.

For two years this machine has been in use, being adapted

FIG. 3.

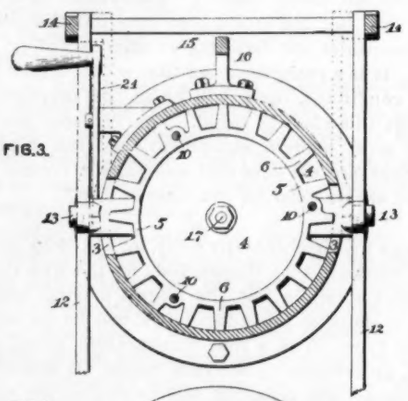
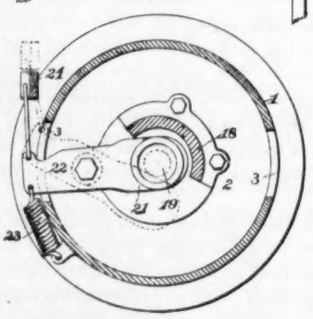


FIG. 4.



to all patterns which draw through a stripping plate. In the case of cast iron boxes, made upright, the inventor in his 20 years' experience in the foundry, has found it impossible to mold by ramming, without showing swells. The machine is especially adapted to molds 6″ to 18″ in height and its inventor has made use of it especially for balls and wagon boxes.

WESTERN FOUNDRYMEN'S ASSOCIATION.

The regular monthly meeting of the Western Foundrymen's Association was held Wednesday evening, Nov. 21, at the Great Northern Hotel, Chicago, with the president, Geo. M. Sargent in the chair.

Those present were the following: Geo. M. Sargent, the Sargent Co., Chicago; Thos. D. West, Thos. D. West Foundry Co., Sharpsville, Pa.; C. A. Sercomb, Schwab & Sercomb, Milwaukee; W. C. Waterbury, Forster, Hawes & Co., Chicago; John S. Rowlands, J. I. Case T. M. Co., Racine; C. E. Louis, Forster, Hawes & Co., Chicago; A. M. Thompson, Link-Belt Machinery Co., Chicago; John K. Mackenzie, Dickman & Mackenzie, Chicago; Geo. F. Wetherell, Preble Machine Works, Chicago; Thos. Smith, Dearborn Foundry Co., Chicago; E. H. Walker, Emerson, Talcott & Co., Rockford, Ill.; James Fyfe, Pickands, Brown & Co., Chicago; James A. Brady, Chicago Hardware Manufacturing Co., Chicago; A. W. McArthur, Rockford Fdry. Co., Rockford, Ill.; M. N. MacLaren, Jr., E. P. Allis Co., Milwaukee; J. H. Dalton, Chas. S. Thompson, Walburn-Swenson Co., Chicago; Wm. M. Wing, Hoyt & Bro. Co., Aurora, Ill.; H. L. Hotchkiss, J. L. Hecht, Deering Harvester Co., Chicago; A. J. Oehring, W. W. Messinger, Western Electric Co., Chicago; L. W. Lukens, O. T. Stantial, H. O. White, Illinois Malleable Iron Co., Chicago; John M. Sweeney, Chicago; W. N. Moore, Joliet Stove Works, Joliet, Ill.; P. S. Dingey, Armour Institute, Chicago; B. M. Gardner, *Iron Trade Review*, Chicago.

The report of the Committee on Comparison of Round and Square Test Bars was read, as follows:

Report of Committee on Comparison of Round and Square Test Bars.

This committee was appointed at the July meeting of the association to investigate the matter of casting round test bars on end, according to the method proposed by Mr. Thos. D. West, of Sharpsville, Pa., as being preferable to the ordinary method of casting square bars flat.

We have followed out our tests with the apparatus furnished by Mr. West and have been guided by his directions, as to details of pouring, etc., thus taking advantage of his experience. The different members have made independent tests, so that this report represents results obtained in several foundries.

Table No. 1 represents a series of tests, carried out to obtain the different properties described in a former paper of Mr. West's, read before the association, on his method of casting round test bars on end. These bars were cast two in a flask and poured from the same ladle of iron at the same time, and are accordingly grouped in pairs.

From the following table, it will be seen that in the nine pairs of bars, only one pair (No. 8) show a solid fracture. In all the other pairs, either one or both bars show flaws. The effect of these flaws is shown directly in the breaking tests, No. 8 being the only pair that broke practically at the same weight. The percentage of bars in this series which showed flaws is 55½%.

TABLE NO. 1.

		Transverse Strength.	Appearance of Fracture.	Shrinkage.	Contraction.	Fluidity.	Chill.	Size of Base
1	1st	1670	slight flaw	0.7	.156 in.	5 1-2 in.	0.19 in.	1.11 in.
	2d	2190	solid.	1.6	.156 "	5 2-5 "	0.19 "	1.11 "
2	1st	1720	slight flaw.	0.4	.140 "	3 1-2 "	0.14 "	1.13 "
	2d	1545	bad flaw.	1.7	.140 "	3 3-5 "	0.14 "	1.13 "
3	1st	1840	slight flaw.	1.3	.140 "	4 3-4 "	0.16 "	1.09 "
	2d	2000	slight flaw.	.6	.140 "	5 1-2 "	0.20 "	1.11 "
4	1st	2320	solid.	1.1	.140 "	6 2-5 "	0.20 "	1.11 "
	2d	1970	slight flaw.	2.1	.150 "	6 "	0.20 "	1.12 "
5	1st	1600	bad flaw.	2.1	.150 "	3 1-2 "	0.19 "	1.11 "
	2d	2095	solid.	1.7	.150 "	2 3-4 "	0.19 "	1.09 "
6	1st	1960	slight flaw.	1.6	.125 "	4 "	0.09 "	1.09 "
	2d	2140	solid.	0.5	.125 "	3 2-5 "	0.11 "	1.11 "
7	1st	2105	solid.	0.8	.150 "	4 "	0.12 "	1.10 "
	2d	1890	slight flaw.	1.2	.170 "	4 3-4 "	0.12 "	1.11 "
8	1st	2690	solid.	1.3	.185 "	2 1-4 "	All White.	1.13 "
	2d	2675	solid.	1.8	.185 "	2 2-5 "	All White.	1.13 "
9	1st	1780	bad flaw.	1.1	.150 "	6 "	0.14 "	1.12 "
	2d	2140	solid.	0.4	.155 "	5 3-4 "	0.14 "	1.13 "

Table No. 2 shows a series of 11 pairs of bars, tested for transverse strength, shrinkage and chill. In this series, 32% of the bars showed flaws.

TABLE NO. 2.

		Transverse Strength.	Appearance of Fracture.	Contraction.	Chill.
1	1st	2100	solid	.136 inch	.09 inch
	2d	2000	solid	.134 "	.12 "
2	1st	flaw	flaw	.130 "	.12 "
	2d	flaw	flaw	.140 "	.08 "
3	1st	2190	solid	.150 "	.11 "
	2d	flaw	flaw	.160 "	.13 "
4	1st	2050	solid	.120 "	.12 "
	2d	1800	flaw	.130 "	.10 "
5	1st	1930	solid	.140 "	.08 "
	2d	1880	flaw	.120 "	.09 "
6	1st	2100	solid	.150 "	.10 "
	2d	1800	solid	.140 "	.08 "
7	1st	2130	solid	.130 "	.10 "
	2d	1800	flaw	.140 "	.11 "
8	1st	2055	solid	.150 "	.08 "
	2d	2040	solid	.130 "	.08 "
9	1st	2180	solid	.160 "	.10 "
	2d	2020	solid	.140 "	.10 "
10	1st	1945	solid	.140 "	.11 "
	2d	2180	solid	.140 "	.10 "
11	1st	1800	flaw	.120 "	.11 "
	2d	2200	solid	.130 "	.10 "

In table No. 3 are shown transverse tests, comparing square bars and round bars. Each set of three bars was cast from the same ladle of iron, the square bars being cast flat in the ordinary way and the round bars on end. In this series the square bars were all perfect, showing no flaws, while of the round bars, there was 43% defective, on account of flaws.

TABLE NO. 3.

	Transverse Strength.	Appearance of Fracture.		Transverse Strength.	Appearance of Fracture.
1st round	1850	flaw	1st round	2100	solid
1 2d round	1970	solid	5 2d round	1920	flaw
3d square	2170	solid	3d square	2100	solid
1st round	1770	flaw	1st round	2260	solid
2 2d round	1990	solid	6 2d round	2030	solid
3d square	2150	solid	3d square	2125	solid
1st round	1790	flaw	1st round	1910	flaw
3 2d round	1560	flaw	7 2d round	2090	soiid
3d square	1790	solid	3d square	2020	solid
1st round	2090	solid			
4 2d round	1860	solid			
3d square	2000	solid			

Table No. 4 shows another series of tests, comparisons being made with square and round bars, as in Table No. 3. In this series the per cent. of square bars defective from flaws is 18%, while of the round bars it is 54½%.

TABLE NO. 4.

	Transverse Strength.	Appearance of Fracture.		Tranverse Strength.	Appearance of Fracture.
1st round	2000	slight flaw	1st round	1740	flaw
1 2d round	1920	flaw	7 2d round	1520	bad flaw
3d square	2060	solid	3d square	2130	solid
1st round	1960	flaw	1st round	1500	bad flaw
2 2d round	2200	solid	8 2d round	1800	solid
3d square	2280	solid	3d square	1820	solid
1st round	1730	flaws	1st round	1920	solid
3 2d round	1940	solid	9 2d round	1920	solid
3d square	1920	solid	3d square	1600	flaw
1st round	1780	slight flaw	1st round	1880	solid
4 2d round	1720	flaws	10 2d round	2000	solid
3d square	1800	solid	3d square	1720	bad flaw
1st round	1940	flaw	1st round	2010	solid
5 2d round	1840	flaw	11 2d round	2120	solid
3d square	1960	solid	3d square	1960	solid
1st round	1940	flaw			
6 2d round	1600	flaw			
3d square	1800	solid			

Still another series of tests, made by one of the committee, comparing the square and round bars, showed the percentage of poor bars, in round bars cast on end, to be much greater than in square bars cast flat, but unfortunately the record of his tests was mislaid and we cannot show the actual figures.

Mr. West's plan for determining contraction, fluidity and chill, we find to be good. His plan for shrinkage, as shown in table No. 1, and in about 100 other bars, not enumerated, shows no uniformity and is impractical.

We are obliged to say that we cannot see anything in the foregoing results that would warrant us in endorsing the round bar, cast on end, as against the square bar, cast flat, for

obtaining the transverse strength, which is the most important test in ordinary foundry practice.

The principal difficulty met with is the frequent appearance of flaws (probably due to method of casting) which does not seem to occur to the same extent in square bars, cast flat. These flaws do not appear to be blow holes, or cavities, but rather slag, or sand flaws.

Respectfully submitted for the committee,

O. T. STANTIAL, Chairman.

Mr. Sweeney: It seems to me that this report should have embodied in it a statement as to what was the length of the bars. Some time these tables might be used for comparison in the matter of strength and, if I am not mis'aken, they do not state what the length of the center is.

Mr. Hotchkiss: The length was twelve inches between supports.

Mr. Sweeney: Has any member of the committee a reason to suggest why the round bars show so much greater percentage of flaws? Ordinarily the bars cast on end would be the freest from flaws. Why is this difference?

Mr. Wing: The committee seem to be somewhat in doubt as to what caused the flaws.

Mr. Hecht: We do feel in doubt as to the cause of the flaws. We could not trace their origin to anything particular. It was speculation on our part.

Mr. A. M. Thompson: Were the bars cast by the committee or were they furnished by Mr. West.

Mr. Hotchkiss: He furnished the patterns, and we cast the bars according to directions given by Mr. West.

Mr. McLaren: Did you pay any attention to breaking these bars in the way they were cast or in the other way? Did you put them into the machine and test them with the side up that they were cast on, or down? I would like to know if these bars were broken according to any rule.

Mr. Hecht: The bars were cast in a vertical position; but they were broken in a horizontal position.

Mr. Sweeney: The bars cast on end should be the freest from flaws. The result is contrary to what would be the accepted view of the case, and there must be some reason for it.

Mr. Walker: What would be the difference in the strength of the round bar if the flaw were away from the point where it broke? I presume the flaws came directly under the breaking point.

Mr. Hecht: That was the only way that we could observe the flaws.

Mr. Moore: Some five or six meetings ago when this matter of test bars first came up I remember I advocated casting round test bars and was very certain that we would get uniform results from them. The evidence of the experiments seems conclusive that the results are not trustworthy. It seems to me a very interesting question, why these square bars poured flat from the same iron and the same man pouring, are cleaner than the bars poured on end. According to all the theory of foundry practice that I have ever learned, these round test bars were cast under the most favorable conditions for producing the most favorable castings; and the result is that they did not do so at all.

Mr. Sweeney: Why should the round bar show so much larger percentage of flaws than the bar cast flat, as the report of this committee shows to be the fact.

Mr. West: I would say on that point, that before sending my appliances on to the committee, I made a great many tests and continued to do so after the appliances had left my hands, and I invariably found good results. It was not long after the committee had the appliances before I heard from their chairman, Mr. Stantial, a very unfavorable report. I was somewhat at a loss to understand why they should have such a large percentage of flaws. Of course it might have been that my own success was due to my carefulness. We al know that it is not the big things, but the little things, that have to be looked after. I thought I would try a young boy, an apprentice, and I had him make me some bars without any special instruction, and in doing so I found very bad results. I found that the bars contained flaws and I commenced to follow him up and see what he was doing and I found little things that he neg'ected. For instance I would find that his ladle would strike the top of the gate, and you can never expect to mix iron with sand without finding them together in some part of the casting. I would find in making his pattern he would secure some parts more tightly than others. That would tend also to create flaws. Although I had several plans in view, I adopted the method which I sent to the committee because it was very easy to break the bar from the gate. The use of a hammer in breaking it from the gate I consider an element which would cause a flaw. Since learning of the committee's report I became satisfied that some other method of gating would have to be adopted. I had the idea at the start of trying a swirl gate; but as I had obtained such good results with my other method, I al'owed it to go as it was. Of course in the iron coming down if there is any dirt in the joint it will mix with the iron. You will see I have raised the gate in this second system. It did not arrive in time for me to make the tests I had hoped to report this evening. The me al goes in on a whirl. If you look down into the mold as it is being poured you will see it whirl at a very rapid rate, and the dirt will be brought up to the top. With this new plan of gating you will find the difficulty will be overcome in the matter of flaws. The only fine point now with this system is starting to pour. It also depends on the nature of the iron a good deal. I found this afternoon with Mr. Stantial out at his works that the gate had to be filed down, as it took the iron faster than the mo'der could keep it up, owing to the extremely hot iron used in his foundry. A dry iron showed itself at the point of fracture.

Mr. Sweeney: The reasons that you have given for the flaws in the round bars cast on end, on account of the method of pouring, etc., would equally app'y to the bars cast flat.

Mr. West: They would to a degree; but in the flat bars the dirt wou'd have a chance to spread out more and not confine itself to one point. In the round bar it generally collects in a body and is apt to roll against the side, and the friction there holds it.

Mr. Sweeney: In the tests you made did you find any flaws?

Mr. West: I cannot say that I found any flaws. I was perfectly satisfied. I felt it would be a success. I was surprised, on receiving the report of the committee, to hear of the percentage of flaws that they found. There is certainly a great deal in practice. The machinery molder has an opportunity of gaining ideas in reference to securing molds that the molder in light work does not have. This second gate will, I think, if there is any dirt created in the mold, bring it up to the top. I had several different forms of gates made and tried with a view of reducing the area so as to have no rapping or breaking. I think the reason the dirt is not so apparent in the flat bar is due to its distribution throughout the bar. I find that in the bars that I have examined that the flaws are strictly sand flaws, some of a very fine character. But that is not what we desire; we want perfection. We find no blow-holes. We have overcome those. We should adopt a system of tests that we can prove by comparison.

Mr. Sercomb: I understand that you say the flaws were all sand flaws, and that there were no blow-holes?

Mr. West: I understand so from the committee's report. They were simply little fine sand holes and no blow holes.

Mr. Sweeney: I am interested to know why the bars cast on end show such a large percentage of flaws over the square bars cast flat. The reason that Mr. West gives is not sufficient to my mind, because the man who molded the square bar molded the round bar. My opinion is that the gate area in these bars is not sufficient. The iron is going to fall down a considerable distance and then turn around and run the other way, and the fact that it goes so much slower, I think is one reason why that state of affairs should occur. I have seen a great many swirl gates and it does not seem to me that it should be necessary to put a swirl gate on so small a diameter of test bars; and my judgment is that with the swirl gate you will find the sand at the center. Perhaps Mr. West may have tried different gate areas on the first bars shown here; but if I were searching for a reason and wanted to make the change it would be in the gate area.

Mr. West: I will endeavor to make myself a little clearer. There is one point that I did not mention. I think you will see that the dirt is at the point of fracture. If there is any dirt in the bar, whether cast flat or on end, when the load is applied the bar will break where the dirt is. In the square

cast bar we have the dirt distributed more—it is thrown out, has more surface. I have been looking down bars a good deal and I notice this: that when the mold is filling up I would see a sort of whirling motion upward, then there would be a little dirt, but soon it would disappear and the ballance of the metal would be perfectly clean. The dirt would all collect together. It is not a large amount of dirt that goes into the bars. It is generally collected in one body.

Mr. Sweeney: Do you think there is anything in the gate area?

Mr. West: I think there is something in it.

Mr. Sweeney: I would be almost willing to wager that the gate was cleaner than the casting.

Mr. West: I feel very confident that the latter plan will overcome the matter of flaws. Some irons will call for a thinner gate than others.

Mr. McArthur: Do I understand that this is a final report from the committee?

Mr. Stantial: It is a final report on that apparatus. Since our report went in Mr. West has perfected what he calls his last apparatus, which we have not had time to thoroughly test. I must say that I agree with Mr. West that those flaws are caused by slag or sand, which is carried in with the iron, in the form of gating which he adopted in his first method. If we can overcome these flaws by any style of gating we shall get perfect bars, which he is confident of obtaining in his last method. We have not made enough experiments with the last method to report on it. The tests have been made hurriedly, but there appears to be merit in this method. I think the point that Mr. Sweeney has made is a good one to follow out.

Mr. West: I arrived here Tuesday morning expecting to have my last appliances here, but the express was delayed and it was only late this afternoon that I was able to make any tests. In the first we found a couple of sand flaws. I instructed the man to be careful in the pouring and we found the last bars perfect. As for myself, I feel very much obliged to Mr. Stantial for his sincere efforts in obtaining data that would be of value. I know that both Mr. Stantial and his foreman, Mr. White, are sincere in the work and worked conscientiously and did their best to achieve the most favorable results.

Mr. Sweeney: I should like to know from Mr. Stantial concerning the 32% of the flaw test bars in table No. 2, how many of them broke at the point where the force was applied.

Mr. Stantial: I have no record to show that. My impression is that they broke within one-half inch of where the load was applied. There might have been a few that broke farther away than that.

Mr. West: I generally find that they break near the point of pressure. If they break away from that it is not more than one-half inch on either side. But the fact that we find dirt at the point of fracture does not prove that the dirt is all there. It might be an inch away and the leverage be sufficient to overcome the weakness.

Mr. Sweeney: In order to account for the round bar showing dirt at the point of fracture you must show some reason why the dirt always goes to the point of fracture. I think that your first plan is better than the last.

Mr. West: I would not agree with you there. It is a better plan only in regard to the breaking of the gate. We all know that the greatest danger of the dirt getting in is at the beginning. After we once get our gates filled then our chances for dirt are slight.

Mr. A. M. Thompson: I think a larger gate would have the effect of putting more dirt into the iron. We all know, who have had anything to do with making clean castings, that the principal object is to choke the gate in the fiast place to keep out the dirt. The iron goes right down to the bottom and it strikes the joint of the mold. There is always more or less loose sand about the joint of the mold and this will have a tendency to start up. Then there is more or less dirt on the lip of the ladle which has always a strong tendency to fall in at the start. If there could be a method of carrying the dirt way through I think this system would get a clean test bar. The process of filling with this gate is so slow that the iron gets cold before it travels up and the dirt that enters will flow on the top of the metal so long as the iron is hot and go to the side as the iron gets cold and stay there. At the same time a larger gate will let in more dirt at the start. If the method could be perfected so as not to allow any dirt to go in at the first pour it would be all right. I think that the trouble with this bar is that it has a tendency to take up the loose sand at the joint.

Mr. McArthur: I have had some experience in making clean iron. I should think those gates were large enough, but I think the vertical gate should be as large as one of those bars. We have had good results with flat gates, let in at the sides.

Mr. West: I have tried those gates but have found that the molder would not keep the gates up and I did not obtain good results.

Mr. Dingey: I am not a foundryman nor a member of this Association, but I have had a good deal of fighting with foundrymen. I have found what Mr. West said as I was coming in very true—that molders are never without an excuse for bad castings. Mr. McArthur spoke of making inlets from the gate to the test-bar to run in an upward direction—which makes me think of a little experience I had some time ago when I was connected with a large machinery foundry. We had to do the same thing to get some clean castings. We had tried all the foundrymen in Chicago. The castings were not test bars, but were what we called "trunks." They were for Willans engines and had to be absolutely perfect. If there was so much as a pin hole in them they had to be thrown away. We had an upper floor pretty well filled with bad castings. A gentleman called, who had worked in England on the same kind of engines, and he said they had no trouble in making these trunks perfect. He told how to get them perfect and we adopted the plan, which is the same as Mr. McArthur has spoken of.

Mr. Moore: Referring to the plan of the test bars again, there are things that have come to me regarding it. It seems to me that one trouble is that when the iron reaches those bars it is too cold. The enlargement of the main gate would probably help that some. The enlargement of the runners would also help it more. It seems to me that by the time those bars were half full the metal would be pretty well chilled down unless it were very hot when it entered. My suggestion would be to so arrange the runner area so as to get the iron in there hotter. The dirt which appears there I understand is sand. The dirt comes out more as the metal cools and if those upright test bars can be kept very hot certainly the result will be more favorable; I think that must be admitted. Whether or not this can be accomplished and the dirt and flaws entirely eliminated by enlarging the gate and runners is a matter of experiment and can hardly be determined by argument. An iron test bar cast in an upright position commends itself to me, as I think it does to almost all of us. I believe we are on the right track in making round test bars cast in an upright position.

Mr. McArthur: I do not know whether you have taken up any tests besides the transverse. I would like to know about the tensile tests.

Mr. Stantial: As far as that is concerned the most important test for the ordinary foundryman is the transverse test and if we fall down on the transverse test we had better get up again before trying any other. I am willing to go on with the tests but when it comes to the question of tensile tests, I would rather resign.

Mr. McArthur: It seems to me that a test bar for foundryman's use should be subjected to the conditions of actual practice. Otherwise it is only valuable to him as a comparative matter. That is to say, whether his iron to-day is as good as it was a week ago when it was satisfactory.

Mr. Moore: Is not tensile strength approximately indicated by the transverse strength? Will not a transverse test carefully taken give one practical knowledge as to the value of the metal for all uses besides those in which the depth of the chill is made an especial quality?

Mr. West: In the paper which was read here at the last meeting I think you will remember that I endeavored to carry the transverse and tensile strength along together, and with the exception of a couple of tests I found a very close uniformity.

Mr. McLaren: I have not had much experience in making tensile tests, as we have no tensile machine, but I have compared the two tests and they do not agree at all. While I have not done enough to be an authority, I do not place any de-

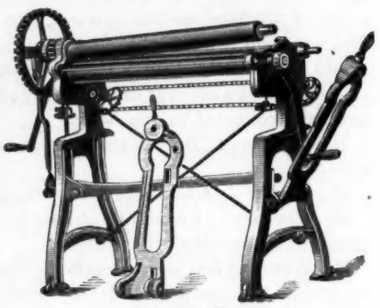
MACHINES FOR WORKING SHEET METAL

Patent Gap Shears.

Patent Gap Shears, Especially designed for Squaring, Trimming and Slitting. 6 to 18 inch throat for Slitting Wide Sheets. Complete for Tin or Iron, to 14 gauge. Seven Styles of various lengths HAND AND POWER.

General Purpose Punch and Shear. Seven Sizes.

Rear Side.



Forming Rolls.

General Purpose Forming Rolls, all sizes. Quickly adjusted and instantly opened—A Revolution. Also Patent Crimping Rolls. Beware of Infringements.

BERTSCH & CO., Cambridge City, Ind.

Save Your Patterns

MARKERS FOR
Fraser's Patent Rapping Plates
With all orders for Rapping Plates we now send markers for bit centers without extra charge. Try them and save your patterns and money.
MIL. F. S. Co.

BY USING
Fraser's Patent Rapping Plates and Lifting Screws.
Pattern Letters and Figures, Flask Clamps and Fittings, Leather Fillet Cutters, Universal Trimmers, Dowel Pins, etc.
MILWAUKEE FOUNDRY SUPPLY COMPANY,
Successors to D. Fraser Mfg. Co. and Eagle Pattern Wks.
MILWAUKEE, WIS.

pendence upon transverse tests as being absolutely accurate. I do not think the result comes close enough to warrant it as being final.

On motion, duly carried, the thanks of the meeting were extended to Mr. West for his kind attendance and explanations.

A vote of thanks was also extended to the Committee for the report and the work done by it and the hope was expressed that it would continue its investigations.

The Secretary offered the names of the following for membership in the Association and they were unanimously elected members: Sloss Iron & Steel Co., Birmingham, Ala.; J. I. Case T. M. Co., Racine, Wis.; and Irving M. Bean, Northwestern Iron Co., Milwaukee, Wis. The meeting then adjourned.

Received from the Trade.

The Phœnix Iron Works Co., of Cleveland, have published a well illustrated pamphlet, including a number of interior views of foundries in which their cranes are installed. The handsome lithographed cover represents a traveling crane with the globe supported from its tackle and the location of the Phœnix Iron Works properly indicated on the sphere. Accompanying the foundry views are letters from purchasers of cranes indicating the service for which they have been found well adapted. The company states that besides completing a large two-story addition it has added new and improved machinery. Its line of manufacture in addition to cranes, includes foundry ladles, crab winches, trucks, shear legs, hydraulic machinery and railroad turntables.

The 17th edition of the catalogue descriptive of their Furman boilers for steam and hot water heating is just issued by the Herendeen Mfg. Co., of Geneva, N. Y. There is a thorough discussion of economical and comfortable house heating and many pages of names of users, with half-tone views of dwellings in which these boilers have been installed.

MR. H. C. COOPER, who has been for some time connected with the Wells & French Car Co., of Chicago, has recently opened an office at 1419 Monadnock Block, Chicago, for the sale of iron and railway supplies. Mr. Cooper represents the Mahoning Valley Iron Co., of Youngstown, O., manufacturers of merchant bar, angles, tank plate, sheet iron, spikes, nails, rivets, shafting, etc.; the Avery Stamping Co., of Cleveland, makers of seamless pressed steel work of every description, and the U. S. Bronze Co., manufacturers of bronze and brass journal bearings of all kinds, motor metal and high grade Babbitt metal.

INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants:—

[If you are in need of machinery of any description, please notify *The Iron Trade Review* and we will put you in communication with our advertisers at once.]

The water works department of Pittsburg will buy a crane for its engine room.

The Supervising Architect, Washington, D. C., will receive sealed proposals until 2 p. m., December 11, 1894, for all the labor and materials required for covering steam pipes, etc., in the U. S. Government building at Brooklyn, N. Y., Bay City, Mich., Denver, Col., Hoboken, N. J., Kalamazoo, Mich., Louisville, Ky., New Bedford, Mass., and Rochester, N. Y.

At Pittsburg bids were opened for the construction of the Soho bridge across the Monongahela. The Schultz Bridge & Iron Co. made the lowest bid and will doubtless get the work. The bids were as follows: Pittsburg Co., $570,000; King Bridge Co., $485,000; Penn Bridge Co., 454,000; Edgemore Bridge Co., $576,000; Groton Bridge & Mfg. Co., $435,000; Massillon Bridge Co., $473,000, and the Schultz Bridge & Iron Co., of Pittsburg, $399,750.

The Hyde Park (Pa.) Iron & Steel Co. has its $75,000 capital stock all subscribed and an order has been placed for a part of its machinery. The officers are: President, J. D. Orr; vice president, J. M. Fiscus; secretary, E. F. Schanwecker; treasurer, T. S. Irwin. The main building will be built entirely of iron, 113x175 feet; annealing house, 50x100 feet; warerooom and packing house, 50x100 feet; boiler house, 60x100 feet. The mill will be fired with natural gas, and its product will include black plates, steel sheet and iron. It is the intention to have the plant in operation by the 1st of March.

New Construction:—

Ground has been broken by the Baltimore & Ohio for the erection of shops at Zanesville, O., to do general repair work, giving employment to 200 men.

The new Brinton, Pa., works of the Westinghouse Electric & Mfg. Co. are being supplied with machinery, and manufacturing will soon begin. The company is said to have $1,500,000 worth of unfilled orders on hand.

It has been decided to rebuild the Whiteley reaper works at Muncie, Ind., Much of the machinery saved from the fire will be installed in the works. The main building will be 80x285 feet with an L at either end, 80x245 feet.

MOUNT SAVAGE FIRE BRICK.

UNION MINING CO.,

Proprietors of the CELEBRATED Mount Savage Fire Brick.

GOVERNMENT ✦ STANDARD.

Established 1841. Capacity, 60,000 Per Day; 18,000,000 Per Year.

The First Manufactory of its Kind in the U. S.

Home Office and Works:—MOUNT SAVAGE, Allegany County, Md.

Branch Offices:—No. 1 Broadway, New York, N. Y.; No. 222 So. Third St., Philadelphia, Pa.; Ferguson Block, Pittsburgh, Pa, Stowe, Fuller & Co., 195 Merwin St., Cleveland, Ohio.

Fire Brick.

High Grade Fire Brick for Melting, Heating and Blast Furnaces.

CUPOLA LININGS, BOILER SETTINGS AND ALL PURPOSES FOR WHICH FIRE BRICK ARE USED—ALL SHAPES.

Ground Clay in Bulk or Sacks. Send for list of shapes.

THE AMERICAN FIRE BRICK & CLAY CO., Mineral Point, Ohio.

Stowe, Fuller & Co.

WESTERN AGENTS OF

Mount Savage and Queen's Run Fire Brick,

The leading BRICK of this country.

MANUFACTURERS OF

OHIO FIRE BRICK. ALL SHAPES IN STOCK.

The largest shippers of FIRE BRICK in the West.

Warehouse and Docks: 193-195 Merwin Street, CLEVELAND, OHIO.

The contracts for machines for the new tin plate department to be started at the LaBelle Iron Works, Wheeling, will be placed at once. A force of men is tearing down puddling furnaces to make room for the new building. It is expected to complete the mill by March 1.

At Scranton, Pa., the Lackawanna Iron & Steel Co. has commenced work on a new boiler shop that is to cost $50,000. It will have a frontage of 239 feet, and a depth of 78 feet. This building has been made necessary by the company's recent purchase of the blast furnaces at Lebanon.

A Wheeling press dispatch says that the Riverside Iron & Steel Co. put a force of men at work in their abandoned nail factory, tearing out the machines and making preparations to remodel the building, the purpose being to change it into a shovel factory. The company makes all kinds of steel pipe and merchant steel, and in the new plant will make all sorts of shovels, hoes and similar implements.

The Berlin Iron Bridge Co., of East Berlin, Conn., will furnish the new power station for the United Electric Light & Power Co., on East 28th St., New York City. The power house is 100 ft. wide and 200 ft. long; the engine room is 100 ft. wide and 80 ft. long, and the boiler room is 56 ft. wide and 100 ft. long, the whole covered with the Berlin Iron Bridge Co.'s corrugated iron roofing. The coal pockets in the boiler room have a capacity of 3,000 tons.

The Harvey Land Association, of Harvey, Ill., have recently located on a 12 acre tract of their land the Davis & Rankin Co., which manufactures machinery and equipment for canning factories, creameries, dairies and butterine factories. The present plant of the company at Lake and Peoria Sts., Chicago, is entirely new, but the excellent railroad facilities at Harvey and the increase in the value of real estate in Chicago determined the company to change its location. The new buildings to be erected at Harvey will cost $300,000. There will be five main structures and a number of smaller ones. Over 1,000 men will be employed in the works when they are completed.

Fires and Accidents:—

At Elwood, Ind., a boiler exploded at the electric lighting and street car power house, wrecking the building. The loss is $60,000.

The Allegheny (Pa.) Traction Co.'s stables and car barns burned Nov. 23, with heavy loss; insurance, $34,000. The engine, boiler, car house and repair shop, 30 motors and car equipments were totally destroyed.

The machine shop, assorting and packing rooms and several several small buildings at the Beaver Falls rail mill of the Carnegie Co. burned Nov. 24, with two engines, considerable machinery, 30 nail machines and 2,000 kegs of nails. The main building, containing 120 nail machines, was saved.

Additions, Enlargements, Removals, Etc.:—

P. & F. Corbin, New Britain, Conn., will soon commence work on a $50,000 addition to their plant.

The Knapp & Cowles Mfg. Co., Bridgeport, Conn., are about to erect an addition to their plant 130x40 feet.

The Berlin Iron Bridge Co., of East Berlin, Conn., have just completed for the Baldwin Locomotive Works, Philadelphia, Pa., steel roof trusses for the addition to their wheel shop.

Wm. Wharton, Jr., & Co., Philadelphia, are adding to their plant a machine shop, a rail and fitting shop and a new foundry 50x214 feet. Most of the machine shop equipment will be run by directly applied electric power.

General Industrial Notes:—

The four foundries at Portsmouth, O., are now in active operation for the first time in two years.

Experimental beams have been turned out recently at the Ironton, Minn., Structural Steel Works.

The steel plant of the Burgess Steel & Iron Works, Portsmouth, O., is in operation again after extensive repairs.

The Dayton (O.) Malleable Iron Works are full of orders. Land has been purchased adjoining the plant for an extension.

The Bellaire, O., steel plant started up last week. The new blast furnace is approaching completion, and the new machine shops are occupied.

Bolt makers in the nut and bolt department of the Indiana Iron Works, Muncie, Ind., have quit work because a 15 per cent reduction was proposed.

Shipments for the steam forge department of the Reading, Pa., Iron Co. in the past few months have been three times those in the same period in 1893.

The receivership of the Cofrode & Saylor Bridge Works, Pottstown, Pa., and the Reading Rolling Mills Co., Reading, Pa., is expected to terminate by Jan. 1.

Application has been made to court, to close out the Shepang Iron Co., at Roxbury, Conn. A charcoal furnace, built in 1866, has not been operated since 1872.

The report that the Witherow plant at New Castle, Pa., would soon start up again is denied. In case a 35,000 loan is secured on an Alabama furnace a start may be made.

Work has begun on tracks leading to the coke ovens which the Cambria Iron Co. are to build at Johnstown, Pa., after the Otto-Coppee system. Work on the ovens will begin as soon as the tracks are done.

The building of the Western Iron & Steel Co.'s mill at Lake View, the suburb of Tacoma, Wash., will furnish a market for holders of wrought iron scrap in the Sound country, who have heretofore had to take whatever price was offered in San Francisco.

At Salem, O., Sharp & Co., whose foundry and machine shop burned some months ago have sued the receiver of the Salem Water Co. for $35,000, claiming that most of their loss could have been prevented had the water pressure been up to the stipulated standard.

Zanesville, O., dispatch says that the directors of the Ohio Iron Co. have decided to make extensive repairs to the mills and resume operations with a full force. The mill has been idle for several years because the operators refused to sign the Amalgamated scale.

The dismantling of the Johnson's Co.'s mills at Johnstown, Pa., has begun and several carloads of material have arrived at Lorain, O. Thus far portions of equipment that could be spared have been taken. Other portions will be removed as soon as present contracts are filled.

The Pittsburg banks holding the paper of the Moorhead-McCleane Co., Pittsburg, have appointed a commission to devise a way of realizing on their claims, in view of the protesting of $50,000 in notes—the first instalment of the extensions made when the firm failed in 1889.

The Dominion of Canada has just closed a contract for steel rails to be used on the government railroads. The Cockerill Works, of Belgium, secured the contract, which is for 4,300 tons, to be delivered at Halifax before June, 1895, free of all costs, including freight, at about £4 per ton.

The Stickney Iron Co., of Baltimore, is now tearing down Furnace A, which has not been in blast for several years, and which will not be rebuilt. The company will still continue to operate Furnace B. Both furnaces have made "Stickney" charcoal pig iron, for malleable iron castings and car wheels.

Morris Sellers & Co., manufacturers of railroad spikes, with offices in the Western Union Bldg., Chicago, confessed judgment last week Tuesday for $25,074 in favor of George P. Jones, a dealer in commercial paper. A statement of the value of the assets of the concern is not available. Morris Sellers is the sole partner in the firm, which owns extensive rolling mills at West Chicago Ave., on the North branch of the Chicago river.

Through Car to Wheeling.

Via Valley and Wheeling & Lake Erie Rys., leaving Cleveland at 11:00 A. M.; Akron, 12:05 noon; Canton, 1:08 P. M. Daily except Sunday.

GASOLINE ENGINES

Stationary & Portable

ALL SIZES.
Dwarfs in size and Giants in Strength.
Costs only 10 cents a Day per H. P. to run them, & scarcely any attention.
EVERY ENGINE GUARANTEED
Write for particulars and testimonials.
THE VANDUZEN GAS & GASOLINE ENGINE CO.
CINCINNATI, O.
Mention this paper when you write.

STEAM USERS

will do well to send for our pamphlet on

FUEL ECONOMY.

Mailed free to any applicant.

THE BRIGHTMAN STOKER CO.,

17 Michigan Street, Cleveland, Ohio.

Best Quality — At Reduced Prices.
CARBONS
BLACK DIAMONDS
FOR
DIAMOND DRILLS.

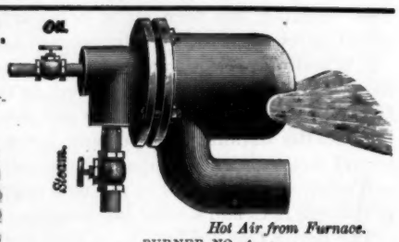
$14.00 Per Carat. — $14.00 Per Carat.
S. D. DESSAU,
IMPORTER,
4 & 6 John St., New York.

THURMAN FUEL OIL BURNER CO.

Gen'l Offices, 35 and 36 Cordova Bldg., INDIANAPOLIS, IND.

Acknowledged the best for Boilers, Forges, Furnaces, Ovens, etc. Write for Catalogues.

BURNER NO. 6.



BURNER NO. 4.

E. A. BOLDT, Sole Agent, Eastern States, 320 and 322 Broadway, New York, N. Y.
J. POWER HELY, Chicago Manager, 1405 Monadnock Block, Chicago, Ill.

NOTE.—If you are using oil as fuel, and are not getting good results, we would be pleased to send you our burners on trial. The oil in our burners can be atomized by either steam or air.

THE McDOWELL STEEL CO.

will introduce into a limited number of foundries their process for making

SEMI-STEEL. SEMI-STEEL

is a metal of great density and high tensile strength, from 32,000 to 42,000 pounds, and is a good substitute in many cases for steel castings.

Address Room 10, Grand Pacific Exchange, Chicago.

CLEVELAND
GALVANIZING
WORKS.
H. H. HODELL & CO.,

Galvanizing in all its branches, and Manufacturers of Rubber Buckets for chain pumps.

CLEVELAND, OHIO.

The "Little Giant" Excavator.

WEIGHT 20 TONS.
CAPACITY 1,500 CUBIC YARDS PER DAY.

The only Traction Shovel on the market, and nothing approaches it for general purposes.

VULCAN IRON WORKS CO., TOLEDO, O., U. S. A.

MANUFACTURERS OF
Dredges and Excavators.
Write for Photographs and Descriptive Matter.
RAILROAD CASTINGS.

There is no Steam Shovel on the market so well adapted to handling Iron Ore as our "Giant." We guarantee 2,500 tons in 10 hours.

The Reason Why

Economy of fuel, rapid melting, the production of a uniform grade and strength of iron is attained in the highest possible degree in the BLAKENEY CUPOLA FURNACE is comprehensively shown in the following cuts:

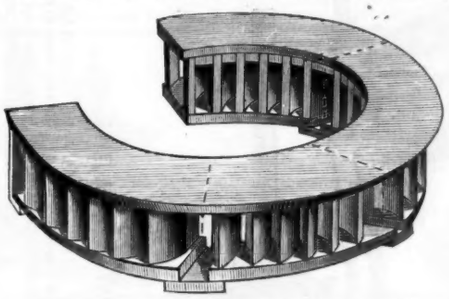


Fig. 1—The Combination of Sections of Tuyeres as placed in wall.

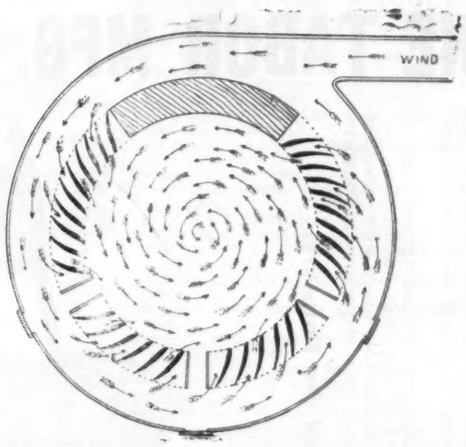


Fig. 2—Showing direction of Wind through the Curved Tuyeres.

Upon the manner of introducing the blast into the cupola depends the degree of combustion attained, consequently that form of tuyeres which will produce maximum results at a minimum cost is the great desideratum. We assert that this has been reached in the "Blakeney" tuyeres to a higher and more satisfactory degree than in any other device known, whether it be a combination of upper and lower tuyeres, a series of pipes, or the old-fashioned tuyeres; and we are certain that a little reflection on the part of any one familiar with cupola practice, will convince him that the projection of the blast through CURVED tuyeres will not only insure its penetration nearer to the center of the cupola, but its more even distribution to all parts of the cupola as well. It is upon this self-evident fact that we base our claim of the attainment of a combustion more nearly approaching perfection than by any other method. With better combustion it necessarily follows that there must be greater economy of fuel, faster melting, less "hanging up," and the production of a more uniform grade and strength of iron. In a word, the "Blakeney" cupola is a continual source of profit and satisfaction in a foundry, and to any one desirous of improving their melting facilities, or who are in the market for a new cupola, we shall be pleased to send a descriptive catalogue. We are quoting "hard time" prices and solicit the privilege of submitting figures. To those whose cupolas are being run at a daily loss as compared with the results attained in the "Blakeney," we desire to state that we are prepared to apply these patent tuyeres and air-chamber to old cupolas at a nominal cost when the shell is in good condition.

A FEW "STRAWS" SHOWING THE WAY THE BLAKENEY CUPOLA "WIND" BLOWS.

LANCASTER, PA., August 29th, 1894.

The Springfield Cupola Co., Springfield, Ohio.

GENTLEMEN: In answer to yours of the 27th inst. regarding the working of the Blakeney Cupola purchased from you in January last, we are pleased to state that since getting the Cupola in operation we have been in receipt of a number of inquiries from interested parties, and our reply has invariably been to the effect that the Cupola is giving us entire satisfaction. We never handled one that melts iron so rapidly, and for rapid work and satisfactory results with the castings we can cheerfully recommend it. Yours truly, THE HUBLEY MANF'G CO., F. H. Steacy, Sec'y.

FULTON, ILL., Aug. 29, 1894.

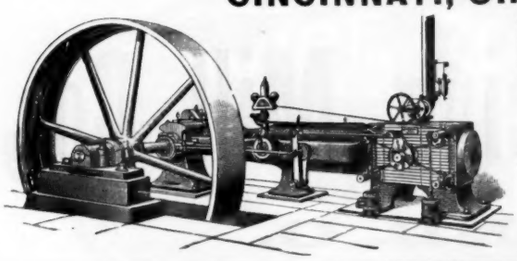
The Springfield Cupola Co., Springfield, Ohio.

GENTLEMEN: Replying to your favor of recent date we would say that it affords us pleasure to state that the No. 4 Blakeney Cupola bought of you last November is giving us just as good satisfaction as the Blakeney we had in use for fifteen years in our works at Tiffin, O. During this time we were familiar with cupolas of other makes, but knew of none which could give the good results attained in yours, consequently when we removed our plant to this city, and were in the market for a new cupola, we immediately communicated with you for the purchase of a new Blakeney. You may refer to us whenever the opportunity offers. Yours truly, THE MISSISSIPPI VALLEY STOVE CO.

THE SPRINGFIELD CUPOLA CO., Springfield, Ohio.

THE LANE & BODLEY CO.,

CINCINNATI, OHIO.



Engines.

ALL SIZES.

Simple and Compound.

Shafting, Hangers, Pulleys.

Belt Elevators, Saw Mills.

LIGHT, CHEAP, COOL, DURABLE,

COLLECTS NO MOISTURE FROM UNDER SIDE. NO DRIPPINGS.

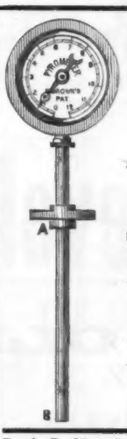
Resists acids and gases arising from inside o **FOUNDRIES, IRON WORKS, MILLS, ETC.**

Litho-Carbon Paint for Metal Roof sand Sidings, Bridges, Smokestacks, etc., covers more space than any other Paint; dries quick, won't crack, peel or blister; will stand a heat of 550° Fahrenheit. Send for 32-page catalogue.

EMPIRE PAINT & ROOFING CO.

111 No. Fourth St., Philadelphia, Pa.

Subscribe for THE IRON TRADE REVIEW, $3.00 per year.



PYROMETERS

Edward Brown,

ESTABLISHED 1860.

311 WALNUT St., PHILADELPHIA.

Manufacturer and Patentee

OF THE

Hot Blast Pyrometer—The only stationary Pyrometer now in use durable over 700 degrees.

Mercury Revolution Indicator.—Centennial Exhibition Medal. Accurate for all time.

Annealing Oven Pyrometer—to 3,000 degrees—of 1893.

Tin-plating Pyrometer—of 1894.

Mercury and Steam Gauges.

Fred. F. Sharpless. - Horace V. Winchell.

SHARPLESS & WINCHELL,

809 and 811 Wright Block, MINNEAPOLIS, MINN.

Analytical Chemists and Assayers.

Consulting Geologists and Mining Experts.

Mines examined. Advice given on treatment of ores and development of properties.

Intimate acquaintance with Lake Superior Mineral Regions.

WANTED!

Second-Hand Iron Tank, about 6 ft. by 6 ft.

Address, stating price,

The Cleveland Ptg. & Pub. Co.,

27-31 Vincent St., CLEVELAND, O.

"THE IRON TRADE REVIEW"

is an increasingly valuable medium through which to sell equipment to machine shops and foundries.

THE TABOR MFG. CO.,

—MANUFACTURERS OF—
AUTOMATIC MOLDING MACHINES,
For Sand Moldsfor Metal Castings.

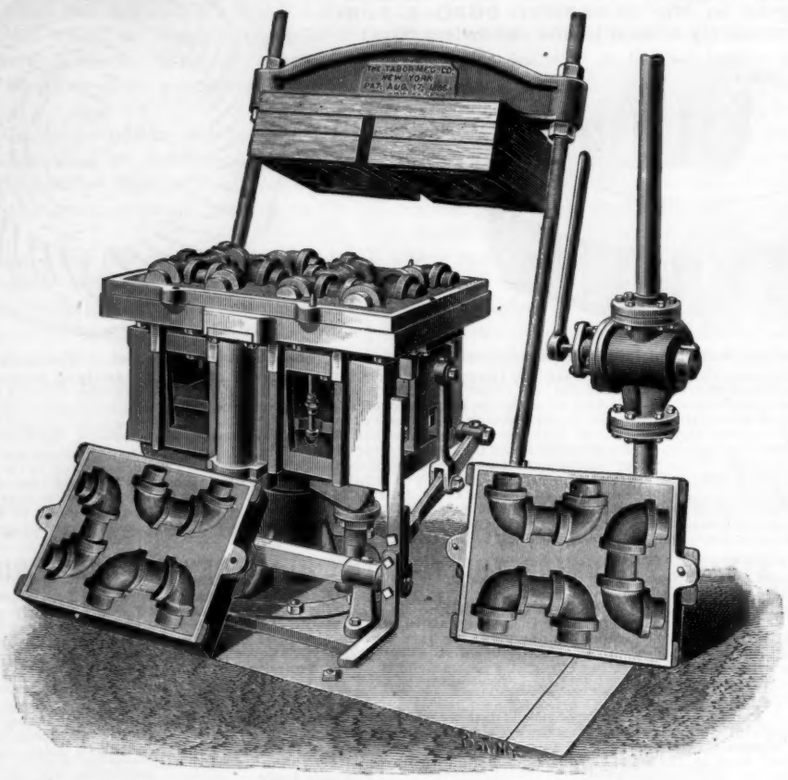
Note the advantages of the **only Power Molding Machine adapted to different sizes and shapes of flasks.**

Our 16″ Duplex will mold, working Duplex, both parts of flask 12″x16″ and all sizes below; this same machine, when working Single will mold flask 16″x20″ and all sizes under.

Our 20″ Duplex will mold, Duplex, both parts of flask 13″x18″ and all smaller sizes; working Single it will mold flask 18″x24″ and smaller sizes.

This feature allows a range of work, by one of our Machines, which would require a number of any other type. This is of the greatest importance to Foundries.

The Milling Machine of the Foundry.



These machines are adapted to general castings when made in reasonable quantities.

The use of these machines is a guarantee of economy, greater quantity and better quality in castings.

Foundrymen who are interested in producing cheap castings of superior quality are invited to correspond with the Company and call at the works, Front and Franklin Streets, Elizabeth, N. J., and see the machines in operation.

The Turret Lathe of the Foundry.

AUTOMATIC DUPLEX MOLDING MACHINE.

113 Liberty Street, - - - NEW YORK, N. Y.

Geo. P. Millns, Pres't and Gen'l Mgr. **Frank H. Chamberlin, Sec'y and Treas.**

The Cleveland Facing Mill Co.,

CLEVELAND, O.

MAKERS OF HIGH GRADE

Importers of LUBRICATING Plumbago.	**FOUNDRY FACINGS, FOUNDRY SUPPLIES, FOUNDRY EQUIPMENTS.**	Importers of INDIA SILVER AND German Black Lead.

And the Celebrated C. F. M. Founders' Perfect Wash, and Heavy A. A. Pure Plumbago. Also Stove Plate Blackings which have never been beaten.

Write for prices on anything you may want. Trial orders solicited.

—FOR—

JESSOP'S STEEL Tools, Drills, Dies, etc.

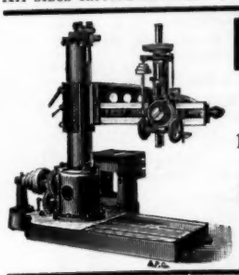
Established over a Century ago. Manufactory, SHEFFIELD, ENGLAND.

CHIEF AMERICAN OFFICE, 91 JOHN ST., NEW YORK.

WM. JESSOP & SONS, Limited.

"Medal—World's Columbian Exposition, 1893."

All sizes carried in stock by The W. Bingham Co., Cleveland, Ohio.



RADIAL DRILLS

Most important Tools manufactured to-day.

Special features found only on our make. It pays to know everything about them.

Write to,

BICKFORD DRILL & TOOL CO.,

35 Pine Street,

CINCINNATI, OHIO.

BARNES'

Upright Drills

Complete line ranging from our New Friction Disk Drill, for light work, to 42-inch Back Geared Self Feed Drill.

Send for Catalogue and Prices.

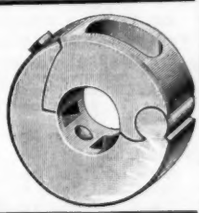
BARNES' WATER EMERY TOOL GRINDER

Has no pumps, no valves. No piping required to supply it with water. Always ready for use. Simplest in construction, most efficient in operation. Send for Catalogue and Prices. 2

W. F. & JOHN BARNES CO., 191 Ruby St. Rockford, Ill.

A small investment will carry an assortment of our

"SPLIT COLLARS,"



sizes to correspond with the shafting you use. They can be put on without disturbing pulleys or boxes. Write for circular.

THE GOUVERNEUR MACHINE CO.,

COUVERNEUR, N. Y.

WIRE ROPE

FOR ALL PURPOSES.

IRON AND STEEL WIRE OF ALL KINDS.

TRENTON IRON CO.

NEW YORK OFFICE COOPER HEWITT & CO. 17 BURLING SLIP

TRENTON, N.J.

WIRE ROPE — TRAMWAYS

S. FREEMAN & SONS MFG. CO.,

11 Bridge St., RACINE, WIS.

MANUFACTURERS OF

Standard Tubular, Fire Box, Vertical and Submerged Tube Steel

BOILERS

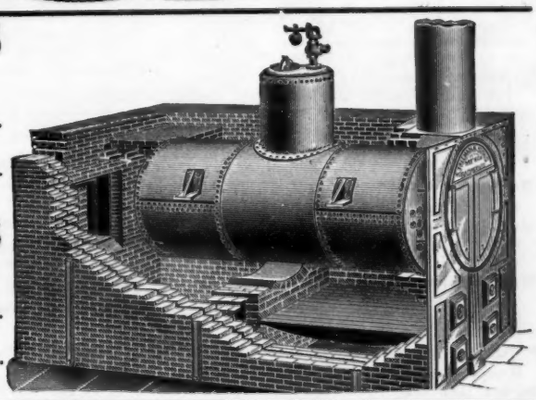
For Stationary, Portable, or Marine use.

Also of **TANKS** of all kinds.

Smokestacks, etc.,

Grey Iron Castings.

Write for Prices and Terms.



The Iron Trade Review

Pays special attention to iron ore, blast furnace, rolling mill, foundry and machine shop interests. Per year **$3.00.**

SECOND-HAND MACHINERY.

9"x4 ft. foot Power engine lathe, screw cutting.
12"x6 ft. screw cutting engine lathe.
13"x5 Putnam plain feed engine lathe, rise and fall carriage.
16x6 Prentiss screw cutting lathe, rise and fall rest with chuck tools, etc. In fine order.
16x6 Pratt & Whitney plain feed lathe, compound rest. In A1 order.
18x6 New Haven lathe, screw cutting, rise and fall rest, with chuck.
20" Wood lathe, complete.
84"x20 ft. Niles lathe, triple geared.
3 speed lathes, 9, 11 and 16 swing.
10" Pratt & Whitney screw machine.
1" Prentiss wire feed screw machine.
12"x4 ft. 6 in. Warner & Swasey turret lathe, 1⅛" hollow spindle.
12"x5 ft. Lodge & Davis plain Fox lathe, chuck and slide rest.
16" Windsor Fox Monitor with swivel and chasing bar.
10x10x2 Hendey hand planer.
16x6x3 Pease Planer.
32x32x9 ft. Pond planer, two heads.
18" Pratt & Whitney level drill.
34" back geared automatic drill.
Forges, chucks, shafting, hangers, pulleys, etc.

Send for photos and full list of second-hand and new tools. Correspondence solicited.

PRENTISS TOOL & SUPPLY CO.,

59 S. Canal St., CHICAGO, ILL.

SECOND-HAND MACHINERY

One Iron Planer 60"x60"x20', 2 heads.
One " " 40"x36"x12', New Haven make.
One " " 26"x24"x5', " " "
One " " 30"x30"x7', " " "
And other sizes.
One Engine Lathe 60"x18' 6" bed, new, Pond make
One " " 54"x24' bed, 2nd hand, " "
One " " 48"x16' " " " Putnam "
One " " 34"x8' " " " " "
One " " 26"x10' " " " " "
And various sizes.
One 28" Back geared, self-feed Drill, New Haven make, A 1.
One 28" Plain Drill, New Haven make, A 1.
One 40" Back geared, self-feed Drill, New Haven make, A 1.
One No. 18 Bliss Press, A 1 order.
18"x12" Self-Contained High Speed Engine.

We can furnish anything in the line of Machinery

NEW YORK MACHINERY DEPOT,

178 Broadway, New York.

E. C. POPE,

COMMISSION DEALER IN

Iron Ore, Pig Iron AND METALS.

Cleveland, - Ohio.

ESTABLISHED 1854.

PETER GERLACH & CO.,

MAKERS OF

Saws, Tools and Machinery.

Office and Warerooms, 28 Columbus St.

Factories on Columbus, Winter and Leonard Sts.,

Cleveland, Ohio, U. S. A.

THE CONDIT-FULLER CO.,

Pig and Bar Iron,

CLEVELAND, . OHIO.

Oglebay, Norton & Co.,

Successors to Tuttle, Oglebay & Co.

Commission Dealers in

IRON ORES,

FROM MARQUETTE, GOGEBIC AND MENOMINEE DISTRICTS.

CLEVELAND, OHIO.

J. H. OUTHWAITE. W. G. POLLOCK.

J. H. OUTHWAITE & CO.,

Exclusive attention given to

LAKE SUPERIOR AND MENOMINEE RANGE

IRON ORE.

Perry-Payne B'ld'g, - Cleveland, O.

TELEPHONE 1916

ECLIPSE MUSIC PLATES

ELECTROTYPE AND

ENGRAVING CO.

58 FRANKFORT ST. CLEVELAND.

BUYERS' DIRECTORY OF IRON AND STEEL TRADES.

Analytical Chemists—
J. Stockly Cary, Chicago, Ill.
Dickman & MacKenzie, Chicago, Ill.
Hollis & Emmerton, Chicago, Ill.
Jopling & Escobar, Cleveland, O.
Sharpless & Winchell, Minneapolis, Minn.

Anti-Friction Metal—
Magnolia Anti-Friction Metal Co., New York.
Ed. Wertheim, Chicago.

Automatic Stokers.—
Brightman Stoker Co., Cleveland, O.

Asbestos Goods—
Ed. Wertheim, Chicago.

Babbitt Metal—
Ed. Wertheim, Chicago.

Blacksmith and Carriage Supplies—
Weber & Co., Cincinnati, O.
G. B. Schulte Sons Co., Cincinnati, O.

Blowers—
Brightman Stoker Co., Cleveland, O.
Buffalo Forge Co., Buffalo, N. Y.

Boilers and Boiler Attachments—
Wm. B. Pollock & Co., Youngstown, O.
Brightman Stoker Co., Cleveland, O.
C. P. Adams, 807 Cuyahoga Bldg., Cleveland, O.
Armstrong Bros., Springfield, O.
R. Laird & Son, Galion, O.
Lane & Bodley Co., Cincinnati, O.
S. Freeman & Sons Mfg. Co., Racine, Wis.
Wheeler Boiler Co., Sharon, Pa.

Boiler Covering—
Ed. Wertheim, Chicago.

Bolts and Bolt Machinery—
Upson Nut Co., Cleveland.

Boring and Turning Mills—
Bickford Drill & Tool Co., Cincinnati, O.
H. Bickford, Lakeport, N. Y.

Carbons for Electric Lights—
Ed. Wertheim, Chicago.

Carbon Points—
S. D. Dessau, 4 and 6 John st., New York City.

Chain Belting—
Jeffrey Mfg. Co., Columbus, O.

Chemists—
J. Stockly Cary, Chicago, Ill.
Dickman & MacKenzie, Chicago, Ill.
Hollis & Emmerton, Chicago, Ill.
Sharpless & Winchell, Minneapolis, Minn.

Chilled and Sand Rolls—
The Lloyd-Booth Co., Youngstown, O.
Wm. Tod & Co., Youngstown, O.
Totten & Hogg I. & S. F'dry Co., Pittsburg, Pa.

Coal and Coke—
F. J. & H. R. Pool, Cleveland, O.
Forster, Hawes & Co., Chicago, Ill.
C. K. Pittman, Chicago, Ill.

Consulting Engineers—
Richard A. Parker, Marquette, Mich.

Core Ovens—
Millett Core Oven Co., Brightwood, Mass.

Cranes and Derricks—
Wm. Tod & Co., Youngstown, O.

Cupolas—
The Springfield Cupola Co., Springfield, O.

Derrick Castings—
Pen Argyl Iron Works, Pen Argyl, Pa.

Dies—
Toledo Machine & Tool Co., Toledo, O.
Cady Mfg. Co., Cleveland, O.

Drill Presses—
Prentiss Tool & Supply Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
W. F. & John Barnes Co., Rockford, Ill.
Hill, Clarke & Co., Chicago, Ill.
J. G. Timolat, 89 S. 5th ave., New York City.
New York Machinery Depot, 178 Broadway, New York City.
Lodge & Shipley Machine Tool Co., Cincinnati.

Drop Forgings—
The Billings & Spencer Co., Hartford, Conn.

Drop Presses—
Toledo Tool & Machine Co., Toledo, O.
Cady Mfg. Co., Cleveland, O.
Bertsch & Co., Cambridge City, Ind.
Fox Machine Co., Grand Rapids, Mich.

Eave Troughs and Conductors—
Berger Mfg. Co., Canton, O.

Emery and Corundum Wheels—
J. Wendell Cole, Columbus and Chicago.
The Tanite Co., Stroudsburg, Pa.

Emery Wheel Machinery—
J. Wendell Cole, M. E., Columbus, O., or Chicago, Ill.

Engineers and Contractors—
Brightman Stoker Co., Cleveland, O.
Richard A. Parker, Marquette, Mich.
C. W. Hunt Co., New York City.
Jopling & Escobar, Cleveland, O.

Engineers' Supplies—
Ed. Wertheim, Chicago.

Engravers and Electrotypers—
Eclipse Electrotype & Engraving Co., Cleveland.
Cleveland Electrotype Foundry, Cleveland.

Engines (Gas)—
Otto Gas Engine Works, Philadelphia, Pa.
Van Dusen Gas Engine Co., Cincinnati, O.
Newell Bros., Cleveland, O.
Buckeye Mfg. Co., Union City, Ind.
Foos Gas Engine Co., Springfield, O.

Engine Packing—
Ed. Wertheim, Chicago.

Engines (Steam)—
Wm. Tod & Co., Youngstown, O.
Brightman Stoker Co., Cleveland, O.
Armstrong Bros., Springfield, O.
The John F. Byers Machine Co., Ravenna, O.
R. Laird & Son, Galion, O.
Totten & Hogg I. & S. F'dry Co., Pittsburg, Pa.
Lane & Bodley Co., Cincinnati, O.
Pen Argyl Iron Works, Pen Argyl, Pa.

Fans—
Buffalo Forge Co., Buffalo N. Y.

Files, Makers of—
E. K. Morris & Co., Cincinnati, O.

Fillet—
Milwaukee Fdy. Supply Co., Milwaukee, Wis.

Fire Brick and Clay—
J. V. Rose, Sharon, Pa.
Union Mining Co., Mt. Savage, Md.
Geo. H. Anderson & Co., Pittsburg, Pa.
Westmoreland Fire Brick Co., Pittsburg, Pa.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
American Fire Brick & Clay Co., Mineral Point, Ohio.
Reese, Hammond & Co., Bolivar, Pa.
Clearfield Fire Brick Co., Clearfield, Pa.
Milwaukee Fdy. Supply Co., Milwaukee, Wis.
Cleveland Facing Mill Co., Cleveland, O.
Stowe, Fuller & Co., Cleveland, O.

Fire Pails—
Thos. J. Bell & Co., Cincinnati, O.

Fire Proof Covering—
Keasbey & Mattison Co., Ambler, Pa.
Ed. Wertheim, Chicago.

Flue Scrapers—
Ed. Wertheim, Chicago.

Foot and Power Lathes—
Prentiss Tool & Supply Co., Chicago, Ill.
W. F. & John Barnes Co., Rockford, Ill.
Hill, Clarke & Co., Chicago, Ill.
New York Machinery Depot, 178 Broadway, New York City.
Lodge & Shipley Machine Tool Co., Cincinnati.

Foundries—
Harn, Ow & Co., Beaver Falls, Pa.
Brightman Stoker Co., Cleveland, O.
The Lloyd-Booth Co., Youngstown, O.
Taylor & Boggis Foundry Co., Cleveland, O.
Wm. Tod & Co., Youngstown, O.
S. Freeman & Sons Mfg. Co., Racine, Wis.
Vulcan Iron Works Co., Toledo, O.

Foundry Supplies—
American Fire Brick & Clay Co., Mineral Point, Ohio.
Clearfield Fire Brick Co., Clearfield, Pa.
Millett Core Oven Co., Brightwood, Mass.
Ohio Sand Co., Conneaut, O.
Milwaukee Fdy. Supply Co., Milwaukee, Wis.
Cleveland Facing Mill Co., Cleveland, O.
Tabor Mfg. Co., New York City.
The Springfield Cupola Co., Springfield, O.

Forgings—
Cleveland City Forge & Iron Co., Cleveland.

Fuel Oil Burners—
Thurman Fuel Oil Burner Co., Indianapolis, Ind

Furnace Linings—
Union Mining Co., Mt. Savage, Md.
American Fire Brick & Clay Co., Mineral Point, Ohio.
Milwaukee Fdy. Supply Co., Milwaukee, Wis.

Galvanizers—
H. H. Hodell & Co., Cleveland.

Gears—
Geo. B. Grant, 86 Seneca st., Cleveland, O.

Grindstones—
E. K. Morris & Co., Cincinnati, O.

Graphite Paint—
Jos. Dixon Crucible Co., Jersey City, N. J.

Heaters and Purifiers—
Stilwell & Bierce Manufacturing Co., Dayton, O.
Brightman Stoker Co., Cleveland, O
Warren, Webster & Co., Camden, N. J.

Heavy Hardware—
E. K. Morris & Co., Cincinnati, O.

Hoisting and Conveying Machinery—
C. W. Hunt Co., New York City.
Pen Argyl Iron Works, Pen Argyl, Pa.

Hoisting Engines—
The John F. Byers Machine Co., Ravenna, O.
C. W. Hunt Co., New York City.
Pen Argyl Iron Works, Pen Argyl, Pa.

Hot Water Heaters—
United States Heater Co., Detroit, Mich.

House Heaters—
United States Heater Co., Detroit, Mich.

Injectors—
Ed. Wertheim, Chicago.

Insurance Companies—
Hartford Steam Boiler I. & I. Co., Hartford, Ct.

Investments—
Fidelity & Deposit Co., Baltimore, Md.

Iron Nails and Steel—
Weber & Co., Cincinnati, O.
G. B. Schulte Sons Co., Cincinnati, O.
Geo. H. Sibell & Co., Chicago, Ill.
Bethlehem Iron Co., South Bethlehem, Pa.

Iron and Steel Roofing—
Sykes Iron & Steel Roofing Co., Niles, O.
Berger Mfg. Co., Canton, O.

Iron Ore, Bar and Pig Iron—
Oglebay, Norton & Co., Cleveland.
J. H. Outhwaite & Co., Cleveland.
Condit-Fuller Co., Cleveland.
E. C. Pope, Cleveland.
Geo. H. Sibell & Co., Chicago, Ill.
Forster, Hawes & Co., Chicago, Ill.

Iron Working Tools—
John Adt & Son, New Haven, Conn.
Bickford Drill & Tool Co., Cincinnati, O.
Cleveland Twist Drill Co., Cleveland, O.
Prentiss Tool & Supply Co., Chicago, Ill.
Toledo Machine & Tool Co., Toledo, O.
W. F. & John Barnes Co., Rockford, Ill.
H. Bickford, Lakeport, N. Y.
Hill, Clarke & Co., Chicago, Ill.
The Billings & Spencer Co., Hartford, Conn.
Cincinnati Milling Machine Co., Cincinnati, O
New York Machinery Depot, 178 Broadway, New York City.
Fox Machine Co., Grand Rapids, Mich.
Geo. B. Grant, 86 Seneca st., Cleveland, O.
Lodge & Shipley Machine Tool Co., Cincinnati.
Manufacturers' Tool Supply Co., Chicago.

Iron and Steel Wire—
Trenton Iron Co., Trenton, N. J.

Link Belting—
The Jeffrey Mfg. Co., Columbus, O.

Lathes—
Prentiss Tool & Supply Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
W. F. & John Barnes Co., Rockford, Ill.
Hill, Clarke & Co., Chicago, Ill.
New York Machinery Depot, 178 Broadway, New York City.
Lodge & Shipley Machine Tool Co., Cincinnati.

Machinists' Tools and Supplies—
Prentiss Tool & Supply Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O
W. F. & John Barnes Co., Rockford, Ill.
H. Bickford, Lakeport, N. Y.
Hill, Clarke & Co., Chicago, Ill.
Cincinnati Milling Machine Co., Cincinnati, O.
Fox Machine Co., Grand Rapids, Mich.
New York Machinery Depot, 178 Broadway, New York City.
Ed. Wertheim, Chicago.
Manufacturers' Tool Supply Co., Chicago.
Gouverneur Machine Co., Gouverneur, N. Y.

Machine Screws—
Illinois Screw Co., Chicago, Ill.

Machine Shops—
Toledo Machine & Tool Co., Toledo, O.
Harn, Ow & Co., Beaver Falls, Pa.

Magnesia Covering—
Keasbey & Mattison Co., Ambler, Pa.

Metal Saws—
Q. & C. Co., Chicago, Ill.

Milling Machines—
Prentiss Tool & Supply Co., Chicago, Ill.
Hill, Clarke & Co., Chicago, Ill.
Cincinnati Milling Machine Co., Cincinnati, O.
New York Machinery Depot, 178 Broadway, New York City.
Lodge & Shipley Machine Tool Co., Cincinnati,

Mining Machinery—
Bucyrus Steam Shovel & Dredge Co., Bucyrus, O.
American Mining & Machinery Co., Cleveland.
C. W. Hunt Co., New York City.
S. D. Dessau, 4 and 6 John st, New York City.
Pen Argyl Iron Works, Pen Argyl, Pa.
Vulcan Iron Works Co, Toledo, O.

Moulding Sand—
Ohio Sand Co., Conneaut, O.
Milwaukee Fdy. Supply Co., Milwaukee, Wis.
Tabor Mfg. Co., New York City.
Cleveland Facing Mill Co., Cleveland, O.

Mining Engineers—
Richard A. Parker, Marquette, Mich.

Oil Cups—
Ed. Wertheim, Chicago.

Oil Pumps—
Ed. Wertheim, Chicago.

Ore Crushers—
American Mining & Machinery Co., Cleveland.

Packing—
Ed. Wertheim, Chicago.

Paint—
Iron Clad Paint Co., Cleveland.
Jos. Dixon Crucible Co., Jersey City, N. J.
Empire Paint & Roofing Co, Philadelphia, Pa.

Pattern Makers—
Milwaukee Fdy. Supply Co., Milwaukee, Wis.

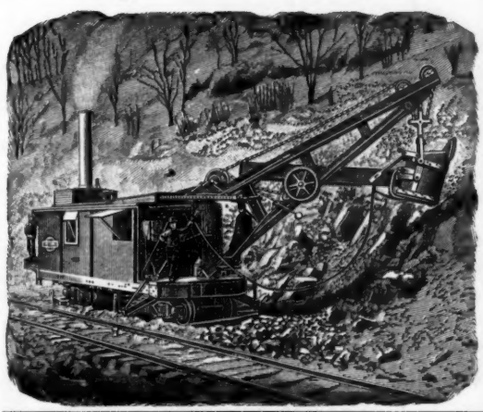
Perforated Sheet Metal—
Harrington & King Perforating Co., Chicago, Ill
Aitchison Perforated Metal Co., Chicago.
Hendrick Mfg. Co. Ltd., Carbondale, Pa

Pipe Covering—
Ed. Wertheim, Chicago.
Plumbers' and Gas Fitters' Supplies—
Ed. Wertheim, Chicago.
Portable Core Ovens—
Millett Core Oven Co., Brightwood, Mass.
Portable Engines and Boilers—
Armstrong Bros., Springfield, O.
Planers—
Prentiss Tool & Supply Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
Hill, Clarke & Co., Chicago, Ill.
New York Machinery Depot, 178 Broadway, New York City.
Lodge & Shipley Machine Tool Co., Cincinnati.
Portable Forges—
Buffalo Forge Co., Buffalo, N. Y.
Cady Mfg. Co., Cleveland, O.
Portable Drills—
J. G. Timolat, 89 S. 5th ave., New York City.
Presses—
Toledo Machine & Tool Co., Toledo, O.
Cady Mfg. Co., Cleveland, O.
Bertsch & Co., Cambridge City, Ind.
Fox Machine Co., Grand Rapids, Mich.
Pulverizing Machinery—
American Mining & Milling Machinery Co. Cleveland, O.
Pumps—
Ed. Wertheim, Chicago.
Pumps (Steam)—
Brightman Stoker Co., Cleveland, O.
Ed. Wertheim, Chicago.
Pyrometers—
Edward Brown, Philadelphia, Pa.
Radial Drills—
Bickford Drill & Tool Co., Cincinnati, O.
Railway Supplies—
Cleveland City Forge & Iron Co., Cleveland.
Ed. Wertheim, Chicago.
Rock Breakers—
American Mining & Machinery Co., Cleveland.
Rolling Mill Machinery—
The Lloyd-Booth Co., Youngstown, O.
Totten & Hogg I. & S. F'dry Co., Pittsburg, Pa.
Roofing (felt)—
Consolidated Roofing Works, Columbus, O.
Empire Paint & Roofing Co., Philadelphia, Pa.
Sand and Chill Rolls—
The Lloyd-Booth Co., Youngstown, O.
Saws—
Peter Gerlach & Co., Cleveland.
Screens for Coal Ore, Etc.
Robt. Aitchison Perforated Metal Co., Chicago.
Harrington & King Perforating Co., Chicago.
Hendrick Mfg. Co., Ltd., Carbondale, Pa.
Scrap Iron & Steel—
Klein & Cohn, Cincinnati, O.
Screws—
Illinois Screw Co., Chicago, Ill.
Semi-Steel—
McDowell Steel Co., Chicago.
Second-Hand Machinery—
Prentiss Tool & Supply Co., Chicago, Ill.
Hill, Clarke & Co., Chicago, Ill.
New York Machinery Depot, 178 Broadway, New York City.
Shearing and Punching Machinery—
Bertsch & Co., Cambridge City, Ind.
Toledo Machine & Tool Co., Toledo, O.
Cady Mfg. Co., Cleveland, O.
Fox Machine Co., Grand Rapids, Mich.
Sheet Iron—
Cleveland Rolling Mill Co., Cleveland.
Berger Bros., Philadelphia, Pa.
Smoke Consumer—
Brightman Stoker Co., Cleveland, O.
Smokeless Furnaces—
Brightman Stoker Co., Cleveland, O.
Special Machinery—
Toledo Machine & Tool Co., Toledo, O.
Cady Mfg. Co., Cleveland, O.
Bertsch & Co., Cambridge City, Ind.
Fox Machine Co., Grand Rapids, Mich.
Lodge & Shipley Machine Tool Co., Cincinnati.
Split Collars—
Gouverneur Machine Co., Gouverneur, N. Y.
Stamping and Punching—
Cady Mfg. Co., Cleveland, O.
Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.
Steam Engines and Boilers—
Pen Argyl Iron Works, Pen Argyl, Pa.
Steam Packing—
Ed. Wertheim, Chicago.
Steam Pipe and Boiler Covering—
Keasbey & Mattison Co., Ambler, Pa.
Ed. Wertheim, Chicago.
Steam Shovels and Dredges—
Bucyrus Steam Shovel & Dredge Co., Bucyrus, O.
Vulcan Iron Works Co., Toledo, O.
Steam Specialties—
Ed. Wertheim, Chicago.
Steel—
Wm. Jessop & Sons, Ltd., New York, N. Y.
Steel Castings—
Wm. Jessop & Sons, Ltd., New York, N. Y.
Steel Rails, Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland.
Bethlehem Iron Co., South Bethlehem, Pa.
Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland.
Stokers—
Brightman Stoker Co., Cleveland, O.
Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland.
Tanks—
R. Laird & Son, Galion, O.
S. Freeman & Sons Mfg. Co., Racine, Wis.
Tinning Machinery—
The Lloyd-Booth Co., Youngstown, O.
Tool Steel—
Wm. Jessop & Sons, Ltd., New York, N. Y.
Tramways—
Trenton Iron Co., Trenton, N. J.
Twist Drills—
Cleveland Twist Drill Co., Cleveland.
Manufacturers' Tool Supply Co., Chicago.
Valves—
Ed. Wertheim, Chicago.
Ventilating Fans—
Brightman Stoker Co., Cleveland, O.
Washers—
Milton Mfg. Co., Milton, Pa.
Water, Gas and Steam Pipe—
Addyston Pipe & Steel Co., Cincinnati, O.
Radford Pipe & Foundry Co., Cincinnati O.
Wire Fences—
McCallip Fence Co., Columbus, O.
Wire Goods—
McCallip Fence Co., Columbus, O.
Wire Rope—
Trenton Iron Co., Trenton, N. J.
C. W. Hunt Co., New York City.
Wire Machinery—
John Adt & Son, New Haven, Conn.
Cady Mfg. Co., Cleveland, O.

RICHARD A. PARKER., C. E.,
Consulting Mining Engineer.
— SPECIALTIES —
Iron, Gold and Silver Mining.
Offices: { 100 W. Washington St., CHICAGO. / MARQUETTE, MICH.

Subscribe for The IRON TRADE REVIEW.

Bucyrus Steam Shovel & Dredge Co.,



—MAKERS OF—

STEAM SHOVELS
STEAM DREDGES
WRECKING CARS
PILE DRIVERS

In Five Sizes for Railroad and Contract Work, Brick Yards, Stone Quarries, Stripping and Handling Iron Ore, Coal, Etc.

Of All Types and Sizes; for All Purposes; Elevator, Dipper, Clam Shell, Suction. Special Machines for Special Work.

BOTH HAND AND STEAM. CAPACITIES 10 TO 35 TONS.

WITH EITHER DROP OR STEAM HAMMERS.

SOUTH MILWAUKEE, WIS., or BUCYRUS, OHIO.

SPECIALTIES:
Am. Crusher and Am. Ball Pulverizer.

The Simplest, Cheapest and Best Machines in the Market. Pulverize wet or dry to any degree of fineness. Make little or no slimes in wet nor dust in dry work. Four sizes, capacity from 2 to 60 tons per day.

SEND FOR CATALOGUE.
Cable Address, American.

First Prize and Gold Medal Awarded by World's Fair, 1893.

THE AMERICAN MINING & MILLING MACHINERY CO.,

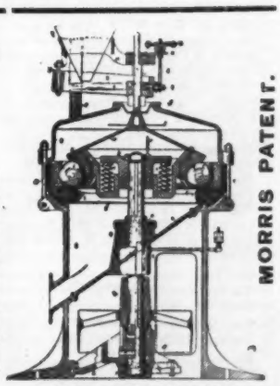
29 Euclid Ave., CLEVELAND, O. 280 Caxton Blk., CHICAGO, ILL.

Office of THE CLEVELAND IRON ORE PAINT CO. and THE GARRY IRON ROOFING CO.,
CLEVELAND, O., Jan. 25, 1894.

The American Mining & Milling Machinery Co., Cleveland, O.:

GENTLEMEN: We purchased a No. 2 American Rock Breaker and a No. 2 American Ball Pulverizer from your company about one year ago. The latter part of April, 1893, we started up for regular work, since which time we have run both of said machines to the full extent of our demands and to our entire satisfaction. The first 700 tons of hard iron ore that we pulverized for paint purposes was ground without taking the Pulverizer apart, and without expending one dollar for repairs for either of these machines. Of the 700 tons spoken of, about 200 tons was Lake Superior Specular iron ore, containing some 70 per cent. iron; a very difficult ore to pulverize. The remainder was a red fossiliferous iron ore, carrying quite a per cent. of silex, which cuts out buhr-stones rapidly. We find that the steel balls, which were when new 5 in. in diameter, now caliper 4⅞ in., and are perfectly round and smooth. The grinding track shows very little wear, and the driving track shows LESS; in fact, the wear is almost imperceptible. These two machines crush and pulverize more than one ton per hour with LESS than 12 H. P. We do not know of any Crusher or Pulverizer that can compare with the output of these two machines in quantity, quality, small amount of wear and tear, and like power. In our opinion, you cannot recommend them too highly. Very truly yours,

CLEVELAND IRON ORE PAINT CO.



THE AM. BALL PULVERIZER.

Alphabetical List of Advertisers.

The star (*) indicates that the adv. appears alternate weeks: the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

	PAGE
Adt, John & Son	28
Adams, C. P.	24
Aitchison, Rob't Perforated Metal Co.	23
American Fire Brick & Clay Co.	15
American Mining & Milling Machinery Co.	21
Anderson & Co., Geo. H.	2
Armstrong Bros.	28
Barnes Co., W. F. & John	19
Bell & Co., Thos. J.	27
Bethlehem Iron Co.	27
*Berger Mfg. Co.	17
Bertsch & Co.	14
Bickford Drill & Tool Co	19
Bickford, H.	28
Billings & Spencer Co.	2
Brightman Stoker Co.	16
Edward Brown	17
Buckeye Mfg. Co.	2
Bucyrus Steam Shovel & Dredge Co.	21
Buffalo Forge Co.	1
Byers Machine Co., John F.	27
Cady Mfg. Co.	23
Cary, J. Stockly	1
Cincinnati Milling Machine Co.	1
Clearfield Fire Brick Co.	27
†Clevel nd Facing Mill Co.	18
Cleveland City Forge & Iron Co.	1
Cleveland Rolling Mill Co.	24
Cleveland Twist Drill Co.	28
Cleveland & Buffalo Transit Co.	22
Cleveland Electrotype Foundry	28
*C. M. & St. P. Ry.	22
Cole, J. Wendell	28
Condit-Fuller Co.	19
Consolidated Roofing Works	28
Dessau, S. D.	16
Dickman & MacKenzie	2
Dixon, Jos. Crucible Co.	23
Eclipse Electrotype & Engraving Co.	19
*Empire Paint & Roofing Co.	17
Fleharty, J. H. & Co.	24
†Foos Gas Engine Co.	—
Forster, Hawes & Co.	1
Fox Machine Co.	1
*Freeman & Sons, S.	19
Gerlach, Peter & Co.	19
Gouverneur Machine Co.	19
Grant, Geo. B.	28
Harrington & King Perforating Co.	26
Hartford Steam Boiler Insp. & Ins. Co.	22
*Hendrick Mfg. Co., Ltd	—
Hill, Clarke Co	1
*Hodell, H. H. & Co.	16
Hollis & Emmerton	2
Hunt Co., C. W.	24
Illinois Screw Co.	1
Iron Clad Paint Co.	23
Jeffrey Mfg. Co.	27
Jessop & Sons, Ltd., Wm.	19
Jopling & Escobar	26
Keasbey & Mattison Co.	2
*Laird & Son	28
Lane & Bodley Co	17
Lloyd Booth Co	26
*Lodge & Shipley	—
Long & Allstatter Co.	23
Magnolia Anti-Friction Metal Co.	1
†Mallett D. T.	—
Manufacturers' Tool Supply Co.	24
McDowell Steel Co.	16
*Millett Core Oven Co.	—
Milton Mfg. Co.	28
Milwaukee Foundry Supply Co.	14
Newell Bros.	1
New York Machinery Depot	19
†Oak Hill Fire Brick & Coal Co.	—
Oglebay, Norton & Co.	19
Ohio Sand Co	28
Otto Gas Engine Co.	26
Outhwaite, J. H. & Co.	19
Parker, Richard A.	21
Pen Argyl Iron Works	27
Pittman C. K.	2
Pollock, Wm. B. & Co.	2
Pool, F. J. & H. R.	1
Pope, E. C.	19
Prentiss Tool & Supply Co.	19
Q. & C. Co	28
Reese, Hammond & Co.	28
Robertson, E. C.	27
‖Sharon Fire Brick Works	1
Sharpless & Winchell	17
Sibell & Co., Geo. H.	2
†Springfield Cupola Co.	17
Stilwell & Bierce Co.	2
Stowe, Fuller & Co.	15
Sykes Iron Roofing Co.	24
†Tabor Mfg. Co.	18
Tanite Co.	28
Taylor & Boggis Foundry Co.	1
Thurman Fuel Oil Burner Co.	16
Timolat, J. G.	24
Tod, Wm. & Co.	26
Toledo Machine & Tool Co.	27
Tott n & Hogg I. & S F'dry Co.	28
*Trenton Iron Co.	19
Union Mining Co.	15
United States Heater Co.	28
Upson Nut Co.	24
Van Duzen Gas Engine Co.	16
Vulcan Iron Works	16
Warren, Webster & Co.	27
Wertheim, Ed.	1
Westmoreland Fire Brick Co.	23
Wheeler Boiler Co.	26

LOCATIONS FOR FACTORIES.

The name of the Chicago, Milwaukee & St. Paul Railway has long been indentified with practical measures for the general upbuilding of its territory and the promotion of its commerce, hence manufacturers have an assurance that they will find themselves at home on the company's lines.

The Chicago, Milwaukee & St. Paul Railway Company owns and operates 6,150 miles (9,900 kilometers) of railway, exclusive of second track, connecting track or sidings. The eight States traversed by the lines of the company, Illinois, Wisconsin, Northern Michigan, Iowa, Missouri, Minnesota, South Dakota, and North Dakota, possess, in addition to the advantages of raw materials' and proximity to markets, that which is the prime factor in the industrial success of a territory—a people who form one live and thriving community of business men, in whose midst it is safe and profitable to settle. Many towns on the line are prepared to treat very favorably with manufacturers who would locate in their vicinity.

Mines of coal, iron, copper, lead and zinc, forests of soft and hard wood, quarries, clays of all kinds, tan-bark, flax and other raw materials exist in its territory in addition to the vast agricultural resources.

A number of new factories have been induced to locate—largely through the instrumentality of this company—at towns on its lines. The central position of the States traversed by the Chicago, Milwaukee & St. Paul Railway, makes it possible to command all the markets of the United States. The trend of manufacturing is Westward. Nothing should be permitted to delay enterprising manufacturers from investigating. Confidential inquiries are treated as such. The information furnished a particular industry is reliable.

Address **LUIS JACKSON,**
Industrial Commissioner, C., M. & St. P. R'y.,
160 Adams St., CHICAGO, ILL.

J. M. ALLEN, President.

WM. B. FRANKLIN, Vice-President.

F. B. ALLEN, Second Vice-President.

J. B. PIERCE, Secretary and Treas.

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO. HARTFORD, CONN.

BURWELL & BRIGGS, General Agents, 208 Superior Street, Cleveland, O.

C. A. BURWELL, Chief Inspector, 208 Superior St., Cleveland O.

J. E. WOLCOTT, Special Agent, 96 4th Avenue, Pittsburgh, Pa.

DIRECTORY
OF
Iron and Steel Works

Embracing a full list of the Blast Furnaces, Rolling Mills, Steel Works and Tin Plate Works in the United States; also all Rod Mills, Wire Mills, Cut-Nail Works, Wire-Nail Works, Car-Axle Works, Car-Wheel Works, Carbuilders, Locomotive Works, Cast and Wrought Iron Pipe Works, Shipbuilding and Bridge Building Works.

PUBLISHED BY
The American Iron and Steel Association,
12th Edition. Corrected to March 1, 1894.
SEND ORDERS NOW. PRICE $5.00, Post-Paid.
ADDRESS,
THE IRON TRADE REVIEW,
Cleveland, O. Chicago, Ill.

IRON AND STEEL MARKETS.

IRON ORE.

[On Lake Erie docks.]

No. 1 Specular, Bessemer	3.00@ 3.35
No. 1 Bessemer hematite	2.75@ 3.00
Hematites No. 1 non-Bessemer	2.00@ 2.50
No 1. Specular, non-Bessemer	2.35@ 3.00

PIG IRON.

CLEVELAND (f. o. b. cars):	
Bessemer	$10 65@$00 00
No. 1 Strong Foundry	11 25@ 11 65
No. 2 Strong Foundry	10 25@ 10 65
No. 1 Gray Forge, red short	9 50@ 9 75
No. 2 Gray Forge, neutral	9 25@ 00 00
No. 1 American Scotch	11 65@ 00 00
No. 2 American Scotch	10 65@ 00 00
Lake Superior Charcoal	13 00@ 13 50
PITTSBURG:	
No. 1 Foundry	$11 25@$11 75
No. 2 Foundry	10 25@ 10 75
Gray Forge	9 50@ 9 75
White and Mottled	9 00@ 9 25
Warm Blast Charcoal	18 00@ 19 00
Cold Blast Charcoal	22 00@ 26 00
Bessemer	10 65@ 00 00
CHICAGO (reported by our representative:)	
Lake Superior Charcoal	$13 00@$14 50
Local Coke Foundry No. 1	10 25@ 10 50
Local Coke Foundry No. 2	10 00@ 10 25
Local Coke Foundry No. 3	9 50@ 10 00
Local Scotch Foundry No. 1	10 75@ 11 00
Local Scotch Foundry No. 2	10 00@ 10 50
Local Scotch Foundry No. 3	9 50@ 10 00
Southern Coke No. 1	11 00@ 11 25
Southern Coke No. 2	10 25@ 10 50
Southern Coke No. 3	10 00@ 10 25
Southern No. 1 Soft	10 25@ 10 50
Southern No. 2 Soft	10 00@ 10 25
Southern Silveries No. 1	11 50@ 11 75
Southern Silveries No. 2	11 25@ 11 50
Jackson Co Silveries	15 00@ 16 00
Ohio Silveries No. 1	14 00@ 14 50
Ohio Silveries No. 2	13 00@ 13 50
Ohio Strong Softeners	13 00@ 13 50
Alabama Car Wheel	17 50@ 18 00
Malleable Bessemer	10 50@ 11 25
Coke Bessemer	11 25@ 11 50
CINCINNATI (reported by Rogers, Brown & Co.)	
Southern Coke No. 1, Foundry	$ 9 75@$10 00
Southern Coke No. 2 and No. 1 Soft	9 25@ 9 50
Hanging Rock Coke, No 1	12 00@ 12 50
Hanging Rock Charcoal No. 1, Fdy	16 00@ 17 00
Tennessee Charcoal No 1	14 00@ 14 50
Jackson County Stone Coal No 1	14 50@ 15 00
Southern Coke, Grey Forge	8 50@ 8 75
" " Mottled	8 25@ 8 50
Standard Alabama Car Wheel	15 75@ 16 75
Tennessee " "	15 50@ 16 00
Lake Superior " "	14 00@ 14 50
BUFFALO (reported by Rogers, Brown & Co.)	
No. 1 Foundry Strong Coke Iron Lake Superior Ore	$11 75
No. 2 Foundry Strong Coke Iron Lake Superior Ore	11 25
Ohio Softener No. 1	12 25
Jackson Co. Silvery No. 1	15 75@ 16 75
Lake Superior Charcoal	13 50
Tennessee Charcoal	15 50
Southern Soft No. 1	11 50
Southern Soft No. 2	11 50
Alabama Car Wheel	16 00@ 17 50
Hanging Rock Charcoal	18 50
LOUISVILLE (reported by Geo. H. Hull & Co.)	
Southern Coke No. 1 Foundry	$10 00@$10 50
Southern Coke No. 2 Foundry	9 25@ 9 50
Southern Coke No. 3 Foundry	8 75@ 9 00
Gray Forge	8 50@ 8 75
Southern Charcoal No. 1 Foundry	12 50@ 13 50
Car Wheel	15 00@ 15 50
Spathite	11 25@ 11 75
ST. LOUIS (reported by Rogers, Brown & Meacham):	
Southern Coke No 1	$10 75@$11 25
Southern Coke No. 2	10 00@ 10 25
Southern Coke No. 3	9 75@ 10 00
Southern Gray Forge	9 50@ 9 75
Southern Charcoal No. 1	14 00@ 14 50
Missouri Charcoal No. 1	12 50@ 13 00
Ohio Softeners	14 00@ 14 50
Lake Superior	15 50@ 16 00
Southern	16 75@ 17 00
Connellsville Coke, St. Louis	4 50

OLD RAILS AND SCRAP METAL.

[Prices paid by mills.]

	GROSS TONS
Old iron rails	$12 50
Old steel rails	10 00
	NET TONS
No. 1 R. R. wrought scrap	$ 9 50
No. 1 wrought scrap	8 50
No. 1 Machine cast scrap	8 50
Iron axles	15 50
Axle turnings	8 00
Wrought turnings (free from cast)	6 50
Cast borings	5 50
Uncut wrought iron boilers	4 00
Steel boiler plates	8 00
Grate bars	5 50
Pipes and flues (clean)	7 00
Tank iron	6 75
Hoop and band iron	6 00
Sheet iron	5 00
Wrought drillings	6 50
Malleable iron	7 00

STRUCTURAL MATERIAL.

Beams and Channels (f. o. b. mill)	1.25c@1.35c
Angles	1.20c@1.25c
Tees	1.35c@1.45c
Universal Plates	1.20c
Sheared Plates	1.30c

Frank P. Cady, Pres. and Supt.
Geo. H. Bowler, Sec'y and Treas.

THE CADY MFG. CO.

283 W. River St., CLEVELAND, O.

AUTOMATIC MACHINERY.
Power Presses, Dies, Drop Hammers, Punches and Shears, Wire Straighteners and Cutters, Wire Forming Machines
SEND FOR CATALOGUE.

PERFORATED METALS

OF ALL KINDS FOR
MILLING MINING AND AGRICULTURAL MACHINERY,

PERFORATED IRON, STEEL, COPPER, BRASS, TIN, ZINC, LEAD, ETC., TO ORDER.
LARGE AND VARIED ASSORTMENT OF SIZES. CORRESPONDENCE SOLICITED.

THE ROBERT AITCHISON. PERFORATED METAL CO.,

OFFICE, ROOM 510 265 TO 269 DEARBORN STREET, CHICAGO, ILL. WORKS SOUTH CHICAGO.

Splice Bar Punch. (1)

—THE—

Long & Allstatter Co.

HAMILTON, O., U. S. A.

Manufacturers of Belt, Steam and Electrically driven

POWER PUNCHES and SHEARS,

for all kinds of Boiler, Tank and Structural Iron Work, Rolling Mills, Locomotive Shops, Car and Wagon Shops, Plow Shops, etc. Send for Catalogue.

A. H. LEITCH, PRES JOHN C. LEITCH, SEC. AND GENL. MAN. JOHN A. WILSON, TREAS.

WESTMORELAND FIRE BRICK CO.

PITTSBURG, PA.

MANUFACTURERS OF HIGH GRADE **FIRE BRICKS.**

Works and Mines, Westmoreland, Pa.

PL DIXON'S PERFECT LUBRICATING GRAPHITE.

The most Marvelous Lubricant Known.
Used Dry, or Mixed with Water, Oil or Grease

NOT AFFECTED BY HEAT, COLD, STEAM OR ACIDS.

An Interesting and Instructive Pamphlet will be sent Free of Charge.

JOS. DIXON CRUCIBLE CO. Jersey City, N. J.

IRON CLAD PAINT CO.

Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g.
CLEVELAND, OHIO.

Trade Mark Patented.

ORDER DIRECT FROM THE

Iron Clad Paint Co.

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.

FURNISHED both Dry and Ground in Oil

USED BY NEARLY ALL THE RAILROADS.

MERCHANT IRON AND STEEL.

[List prices out of store.]

Flat Bar.

1½ to 4 by ⅜ to 1 inch	1 30
4¼ to 6 by ⅜ to 1 inch	1 35
1¾ to 6 by 1⅛ to 2 inch	1 50
1¼ & 1¾ by ⅜ to ¾ inch	1 35
1 & 1⅛ by ⅜ to ¾ inch	1 40
⅝, ⅜, ⅞, by ⅜ to ⅜ inch	1 50

Round and Square.

1 to 1¾ inch	1 30
2 to 2⅝ inch	1 40
2¾ to 3¼ inch	1 55
3⅜ to 4 inch	1 80
4¼ to 4½ inch	2 40
4¾ to 5 inch	2 60

Oval.

⅞ to 1¼ inch	1 50
⅝ to ¾ inch	1 50
½	1 70
⅜	1 90

Half Oval and Half Round.

1½ to 3 inch	1 85
⅞ to 1¼ inch	1 65
⅝ to ¾ inch	1 90
½	2 05
⅜	3 15

Heavy Band.

1¼ to 6 by ¼ and 5-16 inch	1 40
1 to 1¾ by ¼ and 5-16 inch	1 45
¾ to ⅞ by ¼ and 5-16 inch	1 55
½ to ⅝ by ¼ and 5-16 inch	1 80

Hoop Iron.

1 7-16 to 4, No. 13, 14, 15 and 16	1 85
1 7-16 to 2, No. 17, 18 and 19	1 90
1 7-16 to 2, No. 20	2 00
1 7-16 to 2, No. 21	2 10
1 7-16 to 2, No. 22	2 20
1⅛ to 1⅜, No. 13, 14 and 15	1 90
1⅛ to 1⅜, No. 16, 17 and 18	1 95
1⅛ to 1⅜, No 19 and 20	2 00
1⅛ to 1⅜, No. 21	2 10
1⅛ to 1⅜, No. 22	2 20
15-16 and 1 inch, No. 13, 14 and 15	1 85
15-16 and 1 inch, No. 16, 17 and 18	2 00
15-16 and 1 inch, No. 19 and 20	2 10
15-16 and 1 inch, No. 21	2 20
15-16 and 1 inch, No. 22	2 30
⅞, No. 13, 14 and 15	2 10
⅞, No. 16, 17 and 18	2 20
⅞, No. 19 and 20	2 30
⅞, No. 21	2 40
⅞, No. 22	2 50
13-16, No. 13, 14 and 15	2 20
13-16, No. 16, 17 and 18	2 30
13-16, No. 19 and 20	2 40
13-16, No. 21	2 50
13-16, No. 22	2 60
¾, No. 13, 14 and 15	2 30
¾, No. 16, 17 and 18	2 45
¾, No. 19 and 20	2 55
¾, No. 21	2 65
¾, No. 22	2 75
11-16, No. 13, 14 and 15	2 55
11-16, No. 16, 17 and 18	2 60
11-16, No. 19 and 20	2 70
11-16, No. 21	2 80
11-16, No. 22	2 90
11-16, No. 23	3 00
⅝, No. 13, 14 and 15	2 60
⅝, No. 16, 17 and 18	2 70
⅝, No. 19 and 20	2 80
⅝, No. 21	2 90
⅝, No. 22	3 00
⅝, No. 23	3 10
9-16, No. 13, 14 and 15	2 80
9-16, No. 16, 17 and 18	2 90
9-16, No. and 20	3 00
9-16, No. 21	3 10
9-16, No. 22	3 20
9-16, No. 23	3 30
7-16 and ½ inch, No. 13, 14 and 15	3 00
7-16 and ½ inch, No. 16, 17 and 18	3 10
7-16 and ½ inch, No. 19 and 20	3 20
7-16 and ½ inch, No. 21	3 30
7-16 and ½ inch, No. 22	3 40
7-16 and ½ inch, No. 23	3 50
⅜, No. 13, 14 and 15	3 50
⅜, No. 16, 17 and 18	3 60
⅜, No. 19 and 20	3 70
⅜, No. 21	4 00
⅜, No. 22	4 10
⅜, No. 23	4 25

Light Band.

1½ to 6 by ⅛ to 3-16 inch	1 60
1½ to 6 by Nos. 11 and 12	1 65
1 to 1¾ by ⅛ to 3-16 inch	1 65
1 to 1¾ by Nos. 11 and 12	1 70
⅞ and 13-16 by ⅛ to 3-16 inch	1 80
⅞ and 13-16 by Nos. 11 and 12	1 85
¾ and 11-16 by ⅛ to 3-16 inch	1 90
¾ and 11-16 by Nos. 11 and 12	1 95
⅝ and 9-16 by ⅛ to 3-16 inch	2 05
⅝ and 9-16 by Nos. 11 and 12	2 10
½ by ⅛ to 3-16 inch	2 20
½ by Nos. 11 and 12	2 25

Wagon Box Iron.

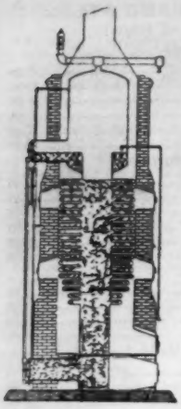
⅞ inch, beveled edge, by Nos. 11 and 12	1 80
⅞ inch, " " " " 13 and 14	1 90
¾ inch, " " " " 11 and 12	1 95
¾ inch, " " " " 13 and 14	2 15

Sheet Iron.

No. 10	1 85
No. 12	1 90
No. 14	1 95
No. 15-17	2 05
No. 18	2 20
No. 20	2 30
No. 22-24	2 40
No. 25.26	2 50
No 27	2 60

Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 60
Shell	1 85
Flange	2 10



THE ADAMS
WATER TUBE BOILER.

This Boiler is absolutely safe from explosion. Gives as much steam from the waste heat as any boiler made. Easy of access for cleaning and repairs. Furnishes perfectly dry steam. Occupies little ground space. Economical in first cost. Send for complete circulars giving list of users and testimonials, one of which is printed below.

The Falcon Tin Plate & Sheet Co., }
NILES, O., Aug. 18, 1893. }

Chas. P. Adams, Esq.

Dear Sir: The three boilers of 225 H. P. each which you furnished us are working in every way satisfactory. We consider them as good steamers as any we have ever used. Up to the present time have spent nothing on them for repairs. Very respectfully,

THE FALCON TIN PLATE & SHEET CO.,
By Warner Arms, Pres't.

C. P. ADAMS.
807 The Cuyahoga, - CLEVELAND. O.

C. W. HUNT COMPANY,

THE HUNT TIP CAR.

45 Broadway, New York,

MANUFACTURERS OF

HOISTING AND CONVEYING MACHINERY

For moving all kinds of material in Steam Power Stations, Factories, Gas Works. Mines, Coal Yards, etc.

Tip Cars, Wire Rope, Barrows. INDUSTRIAL RAILWAYS.

Manufacturers' Tool Supply Co.,

DEALERS IN A FULL LINE OF

MACHINISTS' SUPPLIES.

No. 17 South Canal Street, Chicago.

Morse Twist Drills, Kearney & Foot's Files. Wiley & Russell's Lightning Screw Plates, etc , Billings & Spencer's Wrenches, etc.

CLEVELAND ROLLING MILL CO.,

CLEVELAND, - OHIO,

—MANUFACTURERS OF—

BESSEMER AND OPEN-HEARTH STEEL,

Blooms, Billets, and Slabs, Steel Rails, Steel Beams, Channels and Angles. Steel Forgings, Bar Spring, and Sleigh Shoe Steel. Steel Wire of all kinds. Barbed Wire, Iron and Steel Plates, Galvanized and Black Sheet Iron and Steel Corrugated Iron Roofing

WORLD'S FAIR AWARD.

We are the only Steel Roofing Co. awarded Medal and Diploma for PATENT CAP ROOFING at World's Columbian Exposition. We are also large manufacturers of all styles of METAL ROOFING, SIDING, CEILING, ETC. Send for Catalogue and Price List. Mention this paper.

SYKES IRON & STEEL ROOFING CO., - Chicago and Niles, O.

Moffet Portable Drill

UNSURPASSED AS A REAMER.

Weighs 48 pounds and drills from ⅜ to 2 inches diameter.

Runs with Steam or Compressed air.
Will Work in Any Position.
An Economical Substitute for Rachet Drilling.
Send for Circular.

MANUFACTURED BY

J. G. TIMOLAT

189 and 91 S. Fifth Ave., NEW YORK.

Bolt and Nut Works.

THE UPSON NUT CO., Manufacturers of Nuts, Washers, Carriage, Machine, Plow and Elevator Bolts, Coach Screws, etc.

Steel Stamps and Stencils.

FLEHARTY, J. H. & Co., Rubber Stampes Seals, Stencils, Automatic Check Punchs, and Numbering Machines. 92 Seneca St.

Marine Flange	.2 35
Fire Box	3 35
Above includes plates 90 inches wide.	
90 to 96 in. wide	½c. ℔. extra
96 to 100 in. wide	1 c. "
100 to 104 in. wide	1½c. "
104 to 106 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. ℔s.
1 to 2 in. inclusive	08
9-16 to ⅞ in. "	08½
7-16 to ⅜ and 2⅜ to 3 in	09
3⅛ to 4 in	09½
⅝ to 11-16 and 4⅛	10
⅛ to 6 in	10½
¼ to 9-32 and 6⅛ to 7 in	11
3-16 in	13

Flats.

	cts. ℔s.
2 to 9-16 in. wide by 2 to ⅝ thick	8

Bessemer and O. H. Steel.

Machinery	base price,	1 80
Tire	"	1 85
Spring	"	2 20
Sleigh Shoe	"	2 20
Toe Calk	"	2 05
Cutter Shoes, tapered and bent	"	2 45

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	3 70
Bridge ½, ⅝, 11-16 and ¾ inch diam	3 40

MACHINERY SUPPLY MARKET.

Anvils.

American	℔ 9@10
Wright's	℔ 12

Bellows.

Blacksmiths'	Hill's	dis 40
	Bullock's	dis 50&10
Moulders'		dis 40@40&10
Hand		dis 40&10@50

Belting.

Boston Belting Co.'s standard	dis 70
" " " extra	dis 60&5
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 45
Shultz Raw Hide Leather Belting, single,	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&10
Shultz Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis 45

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.,	dis 35
Buffalo	dis 40

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 30
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis35
Horton's Universal	dis40
" Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 40
Sweetland "	dis 40
Almond Drill	dis 20
Morse "	dis 15
Skinner's Combination Lathe	dis 40&10
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 20

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 15
Brown & Sharpe, Milling Cutters	dis 15
" " Gear Cutters	dis 15

Crowbars.

Cast Steel	℔ 3½
Iron, steel points	℔ lb 3

Drill and Drill Sockets.

Twist Drills	dis 50&10
Morse Taper and Straight Shank to 1½"	dis 50&10
Morse Taper and Straight Shank Larger than 1½"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 55@55&5
Cleveland " "	dis 55@55&5

Emery.

	No. 4 to No. 54 46 gr.	150 gr.	Flour, C. F F. FF.
Kegs, ℔	4½c	5 c	2½c
½ kegs ℔	4¾c	5¼c	2¾c
¼ kegs ℔	5 c	5½c	3 c
10 ℔ cans, 10 in case	6 c	6½c	5 c
10 ℔ cans less than 10	10 c	10 c	7½c

Emery Cloth and Paper.

Barder, Adamson & Co.	dis 50@50&5
H. H. Barton	dis 50@50&5

Emery Wheels.

Detroit	dis 60@70
Norton's	dis 60@70
Grant	dis 60@70
Sterling	dis 60@70
Celluloid	dis 10&33⅓
Northampton	dis 55
Crystal	dis 65@70

ALBANY, N. Y.

RECEIVER'S SALE

OF

VALUABLE PROPERTY.

A Grand Opportunity to Purchase a Manufacturing Plant Cheap.

Taxes Low, Insurance Low. The Town will Offer Many Inducements.

Henry L. Smith, Receiver of the Albany Horse Nail Company, offers for a limited time at private sale, the following:

Lot 367 ft. x 307 ft. 9 in., upon the bank of the Hudson River, and in addition, land under water to center of channel of river. Lot contains one main building 52 ft. x 208 ft. Slate roof, wood and iron frame, solid brick floor, office and store rooms; thoroughly equipped with steam heat, independent water supply, first-class drainage. Also one brick and iron roof boiler house adjoining main building. Main building contains one compound Duplex Engine, 200 horse-power, of the very best and latest make, with all modern appliances; 200 feet of main shafting with pulleys, cups and all complete. Boiler house contains two 100 horse-power boilers with all modern appliances.

Everything new, foundation of engine, setting of boilers and all detail thoroughly first-class.

Location just across Albany city line on the bank of the Hudson River. Dock privileges within 75 feet, and D. & H. C. Co. branch track within 60 feet of building. No cartage. Title absolute.

Property must be sold. Correspondence solicited. Receiver will give all information, and invites inspection.

Will sell separately or with the plant the following:

Large quantity of counter shafting. Foster air pump No. 2. Sturtevant blower No. 8, noiseless, with counter shaft. Three nail pointing machines, one sifter and one tumbler, all new; also 15 tons blank nails made from the S. W. R. brand Swedish steel. Grindstone and solid oak frame, stone 6½ inch face and 6 feet diameter. Weight of stone 2,026 lbs. Emery wheels with table. Two Superb oil tanks, designed to contain oil for fuel. Dimensions, 6 ft. diameter, 24 feet long. Bumptead heads, man hole, caulked inside and out. Perfectly tight and guaranteed under pressure of 30 lbs. All of the above absolutely new, never used, all in good condition. Also many miscellaneous tools, scales, etc., etc. All new.

Entire plant suitable for almost any large manufacturing.

Address or call upon

HENRY L. SMITH, Receiver.

50 State Street, Albany, N. Y.

Vitrified.....dis 60@70
Vulcanite.....dis 60&10
Hamden.....dis 60&10@70
Cyclone.....dis 60@60&10

Files.

Arcade.....dis 60&10@60&10&10
Nicholson.....dis 60&10@60&10&10
" X. F.....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
McClellan.....dis 60&10@60&10&10
Disston's.....dis 65@70
Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 50
Industry File Works Hand Cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs.....12c
" " " " over 5 lbs.....10c

Jack Screws.

Illinois Bolt Co. list.....dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¼	4	3¾	3½
Hexagon	15½	11¼	8½	6	5¼	5¼	
Washers	9	8	7	5	4½	4½	4¼

In lots less than 100 lbs, ₩ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

List July 14, 1887.....dis 85
Standard Penny Nails, ₩ keg card rate
Car lots.....$1.10
Less than car lots...$1.25

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 10@10&10

Packing, Steam.

Boston Belting Co.....dis 60
American Packing Hemp.....₩ lb 9@10
Russia " " .....₩ lb 14
Italian " " .....₩ lb 13@19
Plumbago Piston.....₩ lb 40
Peerless.....₩ lb 60
Morrison's " .....₩ lb 45
Square Flax " .....₩ lb 50
Sheet Rubber.....₩ lb 12&24
Excelsior Rubber.....₩ lb 48
Rainbow.....Full Rolls.....45c ₩ lb; Less than Full Rolls. 50c ₩ lb
Eclipse Gasket.....₩ lb 75

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Pulleys.

Iron Pulleys, Walker List.....dis 50
Medart Pulleys.....dis 50
Split Wood Pulleys.....dis 55@60

Rivets.

Iron, Thousand, list November 17, 1887 dis 50&10@60
Iron, Ordinary, Cooper's Block and Carriage list November 17, 1887.....dis 50&10@60
Copper.....dis 50@50&10

Saws.

Disston's Circular.....dis 40&10
" Band.....dis 25
" Scroll.....Net
Hack Saw Stubs.....dis 20
" " Eureka.....dis 20
" " Star.....dis 20
Saw Swages Diston's.....dis 30
Atkins' Circular Saws.....dis 40&45
" Mill, Mulay and Drag Saws.....dis 40&10
" Wood Saws.....dis 40&10
" Silver Steel Diamond Cross-cut Saws.....70c per ft
" Dexter Cross-cuts.....50c "
" Diamond " .....30c "
" Tuttle Tooth Cross-cuts.....25c "
" One-man Cross-cuts.....32c "
No. 1 Handles.....23c per pair
No. 6 " .....16c "
Excelsior Saw Tools.....$6 per doz
Derfection " .....$15 "
Petroit Saw Works, Circular.....dis 50
" " " Band.....dis 25
" " " Mulay.....dis 45

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list.....dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 55
Pulley Taps.....dis 40

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 15@20
Howard.....dis 35

Wire.

New List, Apr. 9, 1894

Brass.....dis 40
Copper.....dis 40
Bright and annealed, Nos. 0@18.....dis 70&10@75
" " Nos. 19@26.....dis 75@75& 5
" " Nos. 27@36.....dis 75&10& 5
Coppered Nos. 0 to 18, market list.....dis 70@70& 5
Galvanized Nos. 0 to 18 " " .....dis65& 5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire regular.....95c ₩ lb dis 30

Wrenches.

Coe's genuine	dis 50
Girard Standard	dis 70&10
Agricultural	dis 75&10
Mechanic's	dis 55&10& 5
Bemis & Call's Combination	dis 35
Donohue's Engineers	dis 20&10
Lamson & Sessions Engineers	dis 60
Billings & Spencer's Drop Forged	dis 25
William's " "	dis 25
Alligator " "	dis 40

Cleveland Union Station.

Pennsylvania Lines.

Foot of Bank Street.

TICKET OFFICES at Station, Euclid Av., Woodland Av., and Weddell House corner.

THROUGH TRAINS RUN AS FOLLOWS BY CENTRAL TIME
* Daily. † Daily, except Sunday.

FROM CLEVELAND TO	LEAVE	ARRIVE
Pittsburgh and Bellaire	† 7:00 am	†12:10 pm
Salem and Pittsburg	* 8:00 am	* 8:30 pm
Pittsburgh, Bellaire and East	†12:45 pm	† 6:25 pm
Philadelphia and New York	* 1:40 pm	*11:25 am
Baltimore and Washington	* 1:40 pm	*11:25 am
Alliance and Pittsburgh	* 1:40 pm	*11:25 am
Ravenna and Alliance	† 3:25 pm	† 9:50 am
Hudson and Ravenna	* 5:10 pm	* 8:25 am
Philadelphia and New York	*11:10 pm	* 5:25 am
Baltimore and Washington	*11:10 pm	* 5:25 am
Alliance and Pittsburgh	*11:10 pm	* 5:25 am

Mt. Vernon and Pan-Handle Route

FROM CLEVELAND TO	LEAVE	ARRIVE
Xenia and Cincinnati	* 8:40 am	* 5:15 pm
Akron, Columbus & Zanesville	†2:45 pm	*12:10 pm
Akron and Columbus	* 8:40 am	*5:15 pm
Akron and Orrville	† 3:25 pm	† 9.50 am
Columbus and Cincinnati	* 8:00 pm	* 6:55 am

Saturdays the 8:00 pm train will leave at 11:20 pm.

Valley Ry.

Depot foot of So. Water St.
City Office 137 Superior St.

	Arrive.	Depart.
Akron & Canton	*6:30 P M	*7:10 A M
Akron, Canton & Valley Jctn.	*10:10 A M	*3:15 P M
Valley Jctn. & Way Stations	†6:30 P M	†7:10 A M
Akron, Canton & Chicago	*8:00 A M	*6:30 P M
Wooster and Chicago	†2:45 P M	†11:00 A M
Wooster	.....	*6:30 P M
Akron, Canton & Marietta	†2:45 P M	†11:00 A M
Steubenville, Wheeling, Washington, D. C., and Baltimore	†2:45 P M	†11:00 A M

†Daily except Sunday. *Daily. Pullman's Palace Vestibule Drawing Room cars between Cleveland and Chicago.

When you write to firms advertised in our columns, please mention the fact that you took their address from our paper. They will thank you for it.

WHEELER'S

PATENT VERTICAL

WATER TUBE

BOILER.

SAFE,

ECONOMICAL,

DURABLE.

The best boiler made for the use of gaseous fuel at blast furnaces, puddling and heating furnaces.

Address for particulars

WHEELER BOILER CO.,
Sharon, Pa.

Room 508, Cuyahoga Building, **Cleveland, Ohio.**

Jopling & Escobar,

ENGINEERS.

Mining Reports and Estimates. **Spanish-American Business a Specialty.**

STEEL, IRON, COPPER, ZINC, BRASS, TIN,

And all Other Metals Perforated as Required for

GRAIN CLEANING AND MINING MACHINERY,
WOOLEN, COTTON, PAPER AND PULP MILLS,
RICE, FLOUR AND COTTON SEED OIL MILLS,
SUGAR AND MALT HOUSES, DISTILLERIES, FILTER PRESSES,
STONE, COAL AND ORE SCREENS,
BRICK AND TILE WORKS, FILTERS,
SPARK ARRESTERS, GAS AND WATER WORKS,
OIL, GAS AND VAPOR STOVES,
COFFEE MACHINERY, ETC., ETC.

STANDARD SIZES PERFORATED TIN AND BRASS ALWAYS IN STOCK.

THE HARRINGTON & KING PERF. CO.,

Main Office and Works, 222 to 240 N. Union St., Chicago, Ill., U. S. A.

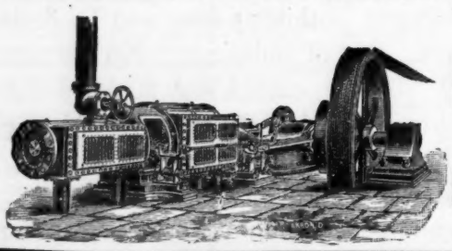
Eastern Office, No. 284 Pearl St., New York.

WILLIAM TOD & CO.

YOUNGSTOWN, OHIO.

THE PORTER-HAMILTON ENGINE

SINGLE, COMPOUND & CONDENSING



Blowing Engines.

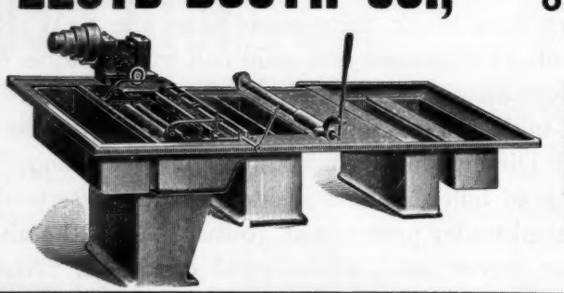
Hydraulic Cranes and Accumulators.

Heavy Special Machinery.

ENGINE CATALOGUE ON APPLICATION

THE LLOYD-BOOTH CO., YOUNGSTOWN, OHIO.

Tinning MACHINERY



Rolling Mills, Sand and Chilled ROLLS.

POWER From **GAS OR GASOLINE.**

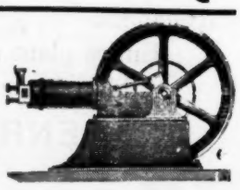
No Steam, Coal, Ash, Gauges, Engineer nor Danger.

From 1 to 100 horse-power. } **Can be Used in City or Country.**

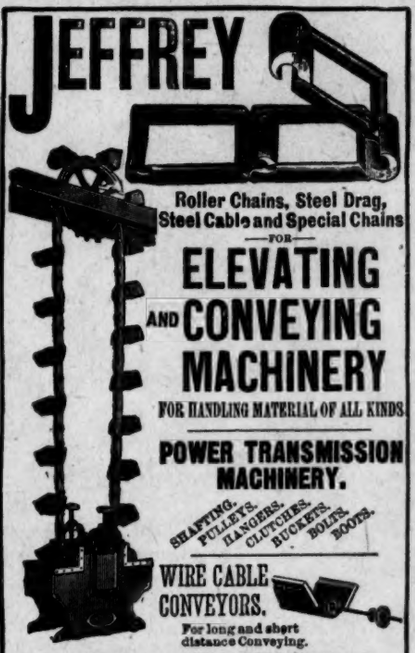
In conjunction with our Producer Gas Apparatus, we guarantee coal consumption of 1¼ pounds per hour per h.p.

OTTO GAS ENGINE WORKS., 33rd & Walnut Sts. PHILADELPHIA, PA

S. M. York, 42 S. Water St., Cleveland Agent.



JEFFREY



Roller Chains, Steel Drag, Steel Cable and Special Chains

—FOR—

ELEVATING AND CONVEYING MACHINERY

FOR HANDLING MATERIAL OF ALL KINDS.

POWER TRANSMISSION MACHINERY.

SHAFTING. PULLEYS. HANGERS. CLUTCHES. BUCKETS. BOLTS. BOOTS.

WIRE CABLE CONVEYORS.

For long and short distance Conveying.

THE JEFFREY MFG. CO. Columbus, Ohio.

163 Washington St. NEW YORK.

Send for Catalogue.

HOISTING ENGINES

OF ANY POWER OR STYLE.

Single or Double Cylinder. Improved Patent Friction Drums, especially adapted to Bridge Building, Pile Driving, etc. Mine and Quarry Hoisting Engines. Haulage Engines of all kinds.

All engines built with single or double drums, with or without Boilers and with link motion or friction. Write for prices to

Pen Argyl Iron Works,

Pen Argyl, Pa.

HOISTING ENGINES

MANUF'D BY THE JOHN F. BYERS MACHINE CO., RAVENNA, OHIO

WRITE FOR CATALOGUE.

NOW is the time to INVEST in

SOUTHERN TIMBER-MINERAL LANDS,

Before prices advance. All kinds of mines for sale.

E. C. ROBERTSON,

Terms Easy. CINCINNATI, O. Titles Perfect.

THE BETHLEHEM IRON CO.,

Principal Office and Works:

SOUTH BETHLEHEM, PA.

STEEL RAILS.

BILLETS AND MUCK BAR,

STEEL FORGINGS.

HOLLOW SHAFTING, CRANKS, ROLLS, GUNS AND ARMOR.

Rough, Machined or Finished, Fluid Compressed, Hydraulic Forged.

NEW YORK OFFICE, 80 BROADWAY. PHILADELPHIA OFFICE, 421 CHESTNUT ST.

Western Agents: Fisher & Porter, 1025 Monadnock Bldg., Chicago, Ill.

THE TOLEDO MACHINE & TOOL CO

501-505 Superior St.. Toledo, Ohio.

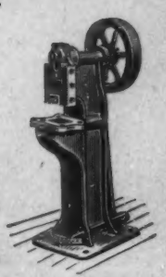
We manufacture

No. 34 Power Press.

Power Punches, Forging Presses,
Power Presses, Trimming Presses,
Straight Sided Double Pitman Presses,
Drop Presses,
Embossing Presses, Automatic Feed Presses.
Stamping Presses, Power Slitting Machines.
Riveting Machines, Power Shears.

Special and Automatic Machinery Dies for all classes of work in sheet metals,

Write for catalogue and prices.



No. 31 Power Press.

THE "CLEARFIELD" FIRE BRICK

MANUFACTURED BY

THE CLEARFIELD FIRE BRICK CO., Limited,

Office and Works at CLEARFIELD, PA.

929 Liberty Street, Pittsburg, Pa., John Richardson, Agent.

R. LAIRD & SON, Galion, O., PROPRIETORS OF THE

GALION STEAM BOILER WORKS,

MANUFACTURERS OF

Portable and Stationary Steam Boilers. Oil and Water Tanks and all kinds of Sheet Iron Work.

CASTINGS OF ALL KINDS AND DESCRIPTIONS. Also dealers in STEAM ENGINES, PUMPS, INJECTORS AND EJECTORS.

FIRE PROTECTION.

The Latest and Best Chemical Devices.

Approved by all Underwriters.

The FAVORITE Chemical Engines are positively Non Corrosive and the most powerful on the market. Uses no acid or other harmful chemical; no stored air. Throws stream 50 feet distant. Charged with the most powerful extinguishing fluid ever before placed on the market. Non explosive, from which soda and acid machines are not free. Made in three sizes, 2, 3 and 5 gallon capacity. Copper or Nickle-plated.

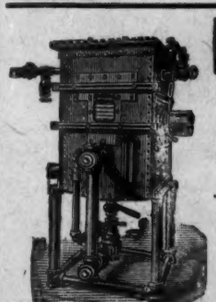
Nuhring Hose Racks, with and without Automatic Hose Valves, Fire Hose and all other Appliances for Fire Protection.

THOS. J. BELL & CO.,

121 Main St., CINCINNATI, OHIO.

Extensive Dealers in ENGINEERS' AND MILL SUPPLIES.

Bell's Chemical FIRE PAIL Has metal cover hermetically sealed. Pat. March 20, 1894.



WE NEVER SOLD ONE

of our ***Vacuum Feed Water Heaters and Purifiers*** *until we had first satisfied our customer that it was capable of saving money for him. Our Catalogue will make this saving clear to you. Shall we mail it? We also build the Webster Separator and Williames Vacuum System of Steam Heating.*

WARREN WEBSTER & CO.,

NEW YORK, 126 Liberty Street. CHICAGO, Monadnock Building.

CAMDEN, N. J.

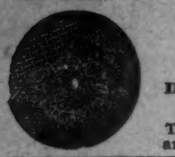
No. 8.

CLEVELAND

1874—OLD (SEND FOR CATALOGUE. WRITE FOR DISCOUNT.) RELIABLE—1894

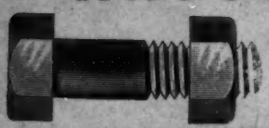
THE HART OR DETROIT

Emery Corundum Wheels and Machinery.



Write to J. WENDELL COLE, M. E.,
District Manager, Box 152, Chicago, Ill., or Box 84, Columbus, O.
☞ N. B.—Also Agent for WM. SELLERS & CO.'s SPECIAL TOOL GRINDER and TWIST DRILL GRINDER WITH POINTER, for Pennsylvania, Ohio, Indiana, Illinois and Wisconsin.

WROUGHT WASHERS,

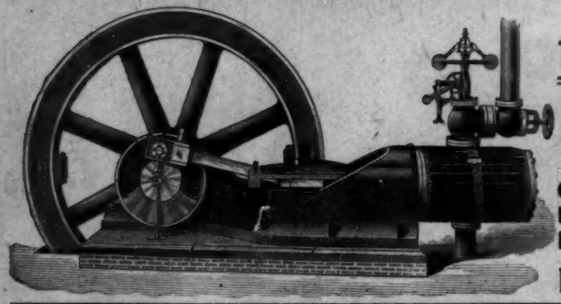


MACHINE BOLTS, HOT PRESSED NUTS,
HIGHEST STANDARD OF EXCELLENCE.
The MILTON MFG. CO., MILTON, PA.

5 Horse Power Engine and Boiler $165
SAW MILL ENGINE AND BOILER. $450.
Other sizes in Proportion.
Engines and Boilers 2 to 500 H. P.
For Circulars address
Armstrong Bros., Springfield, O.

Emery Emery Wheels, Grinding Machines, Grinders' Supplies ... Quick process and large stock.
WHEN IN A HURRY ORDER OF
The Tanite Co., Stroudsburg, Monroe Co., Pa., U. S. A.
New York, 161 Washington Street.
Cincinnati, 1 West Pearl Street.
London, Eng., Thos. Hamilton, 90 Cannon St., E. C.

TOTTEN & HOGG I. & S. F'DRY CO.



Manufacturers of
The "Ætna" Rolling Mill
ENGINE
Chilled and Sand Rolls and Rolling Mill Machinery.
Pittsburg, Pa.

Established 1879.

THE OHIO SAND COMPANY

SHIPPERS OF ALL GRADES OF
MOULDING SAND.
Our Sand is SECOND TO NONE. Banks at Conneaut and Kingsville. Samples and Prices on Application.
Conneaut, Ohio.

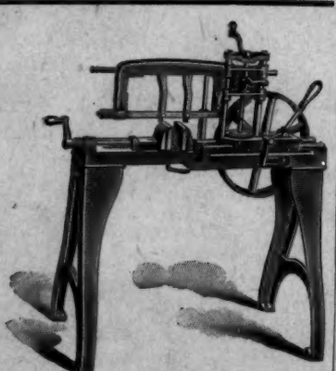
ASPHALT SEAMLESS ROOFING

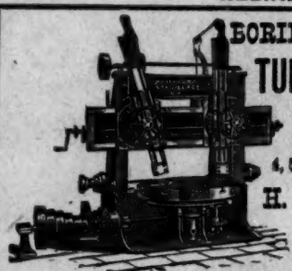
The maximum results with a minimum expense, with complete adaptability for the highest structural requirements.
Manufactured by
Consolidated Roofing Works, Columbus, O.
M. H. CRITTENDEN & SON, Minneapolis, Minn. | MILLER OIL CO., Indianapolis, Ind. | H. M. REYNOLDS & SON, Grand Rapids, Mich

Saves Its Cost in 3 Months.
Automatic Variable Feed
Horizontal Stroke
Perfect Cutting

THE Q AND C

SHOP SAW
703-706 W. U. Building,
CHICAGO.
29 Broadway, - NEW YORK.





BORING AND TURNING MILLS,
4, 5 & 6 Ft. Swing.
H. Bickford,
Lakeport, N. H.
Send for Photograph and Low Price.

CAPITOL HOT-WATER HECLA STEAM
HEATERS
UNITED STATES HEATER CO
DETROIT, MICH.
105 HIGH ST. BOSTON
100 LAKE ST. CHICAGO
Our little book WARMTH FOR WINTER HOMES contains information on HOT-WATER HEATING, RADIATION, VENTILATION, ETC. THAT IS READ WITH INTEREST BY ALL CONCERNED WITH THESE SUBJECTS. WE SEND IT FREE

CLEVELAND ELECTROTYPE CO.
ELECTROTYPING & ENGRAVING
50 HIGH ST. TEL. 2139

Elastic Rotary-Blow Riveting Machine.

JOHN ADT & SON,
NEW HAVEN, CONN.
Builders of Machinery for Hardware Manufacture.
AUTOMATIC
Wire Straightening and Cutting Machines,
BUTT MILLING MACHINERY,
Butt Drilling Machinery,
Riveting Machines,
Foot Presses,
Screw Cutters, Etc.

Equaled by Few, . . Excelled by None.
"HAMMOND" AND "ACME"
HIGH GRADE FIRE BRICK
MANUFACTURED BY
Reese, Hammond & Co.,
BOLIVAR, PA.
Specialties: Tile, Grate Settings, Stove Linings and Difficult Shapes to order on short notice.
Correspondence Solicited.

GRANT GEARS

Ready Made Cut Gears.
Ready Made Cast Gears.
Ready Made Brass Gears
Gears Made to Order.
Gear Cutting.
Treatise on Gears, $1.00.
Gear Cutting Machines.
GEORGE B. GRANT,
Lexington, Mass., and 82 Seneca St., Cleveland, O.